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DRAFT ECONOMIC IMPACT ANALYSIS OF PROPOSED CRITICAL HABITAT FOR THREATENED AND ENDANGERED PLANTS ON MAUI

REVISED DETERMINATIONS

September 2002

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TABLE OF CONTENTS

Page

Tables

PREFACE

The U.S. Fish and Wildlife Service has added this preface to all economic analyses of critical habitat designations:

"The standard best practice in economic analysis is applying an approach that measures costs, benefits, and other impacts arising from a regulatory action against a baseline scenario of the world without the regulation. Guidelines on economic analysis, developed in accordance with the recommendations set forth in Executive Order 12866 ('Regulatory Planning and Review'), for both the Office of Management and Budget and the Department of the Interior, note the appropriateness of the approach:

> *'The baseline is the state of the world that would exist without the proposed action. All costs and benefits that are included in the analysis should be incremental with respect to this baseline.'*

"When viewed in this way the economic impacts of critical habitat designation involve evaluating the 'without critical habitat' baseline versus the 'with critical habitat' scenario. Impacts of a designation equal the difference, or the increment, between these two scenarios. Measured differences between the baseline and the scenario in which critical habitat is designated may include (but are not limited to) changes in land use, environmental quality, property values, or time and effort expended on consultations and other activities by federal landowners, federal action agencies, and in some instances, State and local governments and/or private third parties. Incremental changes may be either positive (benefits) or negative (costs).

"In New Mexico Cattle Growers Ass'n v. U.S.F.W.S., 248 F.3d 1277 (10th Cir. 2001), however, the 10th Circuit recently held that the baseline approach to economic analysis of critical habitat designations that was used by the Service for the southwestern willow flycatcher designation was 'not in accord with the language or intent of the ESA.' In particular, the court was concerned that the Service had failed to analyze any economic impact that would result from the designation, because it took the position in the economic analysis that there was no economic impact from critical habitat that was incremental to, rather than merely co-extensive with, the economic impact of listing the species. The Service had therefore assigned all of the possible impacts of designation to the listing of the species, without acknowledging any uncertainty in this conclusion or considering such potential impacts as transaction costs, reinitiations, or indirect costs. The court rejected the baseline approach incorporated in that designation, concluding that, by obviating the need to perform any analysis of economic impacts, such an approach rendered the economic analysis requirement meaningless: 'The statutory language is plain in requiring some kind of consideration of economic impact in the CHD phase.'

"In this analysis, the Service addresses the 10th Circuit's concern that we give meaning to the ESA's requirement of considering the economic impacts of designation by acknowledging the uncertainty of assigning certain post-designation economic impacts (particularly section 7 consultations) as having resulted from either the listing or the designation. The Service believes that for many species the designation of critical habitat has a relatively small economic impact, particularly in areas where consultations have been ongoing with respect to the species. This is because the majority of the consultations and associated project modifications, if any, already

consider habitat impacts and as a result, the process is not likely to change due to the designation of critical habitat. Nevertheless, we recognize that the nationwide history of consultations on critical habitat is not broad, and, in any particular case, there may be considerable uncertainty whether an impact is due to the critical habitat designation or the listing alone. We also understand that the public wants to know more about the kinds of costs consultations impose and frequently believe that designation could require additional project modifications.

"Therefore, this analysis incorporates two baselines. One addresses the impacts of critical habitat designation that may be 'attributable co-extensively' to the listing of the species. Because of the potential uncertainty about the benefits and economic costs resulting from critical habitat designations, we believe it is reasonable to estimate the upper bounds of the cost of project modifications based on the benefits and economic costs of project modifications that would be required due to consultation under the jeopardy standard. It is important to note that the inclusion of impacts attributable co-extensively to the listing does not convert the economic analysis into a tool to be considered in the context of a listing decision. As the court reaffirmed in the southwestern willow flycatcher decision, 'the ESA clearly bars economic considerations from having a seat at the table when the listing determination is being made.'

"The other baseline, the lower boundary baseline, will be a more traditional rulemaking baseline. It will attempt to provide the Service's best analysis of which of the effects of future consultations actually result from the regulatory action under review - i.e. the critical habitat designation. These costs will in most cases be the costs of additional consultations, reinitiated consultations, and additional project modifications that would not have been required under the jeopardy standard alone as well as costs resulting from uncertainty and perceptional impacts on markets."

DATED: March 20, 2002

FOREWORD

1. CONTENT AND PURPOSE

This report assesses the economic impacts that may result from the designation of critical habitat for threatened and endangered plant species on the islands of Maui and Kaho'olawe in the State of Hawai'i. It was prepared for the U.S. Fish and Wildlife Service (the Service) to help them in their decision regarding designating critical habitat for the plant species.

As required by the Endangered Species Act, as amended (the Act), the decision to designate a particular area as critical habitat must take into account the potential economic impact of the critical habitat designation. If the economic analysis reveals that the economic impacts of designating any area as critical habitat outweigh the benefits of designation, then the Service may exclude the area from consideration, unless excluding the area will result in the extinction of the species.

The focus of the economic analysis is on section 7(a)(2) of the Act which requires consultation with the Service and possible project modification for certain projects and activities that may affect a species listed as threatened or endangered, or the habitat of a listed species. The consultations and possible project modifications will have economic impacts which, in this report, are referred to as "section 7 economic impacts" to distinguish them from the economic impacts related to other sections of the Act. Other sections of the Act are outside the scope of this economic analysis.

2. ORGANIZATION

This report is organized into six chapters:

— Chapter I: The Listed Plants and Proposed Critical Habitat

This chapter provides relevant information on the plant species and the proposed critical habitat units.

— Chapter II: Physical and Socioeconomic Profile of Maui County

To provide the context for evaluating the economic impacts of the proposed critical habitat designation, this chapter presents a physical description of the islands of Maui County and the socioeconomic profile of Maui County.

— Chapter III: The Endangered Species Act

Relevant information from the Act is presented in Chapter III, including the role of critical habitat designation in protecting threatened and endangered species, requirements for consulting with the Service, and the definition of taking and other restrictions.

— Chapter IV: Existing Protections

This chapter presents information on existing regulations and land management policies that protect wildlife species or their habitats.

— Chapter V: Approach to the Economic Impact Analysis

This chapter gives the general approach used to estimate section 7 economic impacts of the species listing and the critical habitat designation.

— Chapter VI: Economic Costs and Benefits

This chapter discusses planned projects, activities and land uses in the proposed critical habitat units and estimates section 7 economic costs and benefits. This chapter also identifies the effects which can be attributable solely to the critical-habitat provisions of section 7.

After learning about the proposed critical habitat (Chapter I), readers who are already familiar with Maui County (Chapter II), the Act (Chapter III), existing protections (Chapter IV), or the approach to conducting the economic analysis (Chapter V) may wish to skip these chapters, as appropriate, and proceed to the economic analysis (Chapter VI).

3. TERMINOLOGY

The following Service terminology is *italicized* throughout this document for the benefit of readers who are unfamiliar with it and want to be reminded that the Service has given specific meanings to these words and terms: *Federal involvement, Federal nexus, occupied, unoccupied*, *primary constituent elements, jeopardy, adverse modification,* and *take.* The terms are explained in the body of the report.

4. ECONOMIC CONSULTANTS

The analysis was performed by Industrial Economics, Inc (IEc), an economic consulting firm in Cambridge, Massachusetts and Anden Consulting, based in Honolulu, Hawai‘i, under subcontract to IEc. In conducting the analysis, IEc and Anden Consulting worked in Hawai‘i with the Service and with Hawai‘i government agencies, companies, and organizations listed in the References. Decision Analysts Hawai‘i, Inc. (DAHI)–a Hawai‘i based economic consulting firm under subcontract to IEc–conducted similar analyses for other species in Hawai‘i and provided advice and assistance to Anden Consulting and IEc on this report.

EXECUTIVE SUMMARY

1. INTRODUCTION

The purpose of this report is to identify and analyze the potential economic impacts that would result from the proposed critical habitat designation for the threatened and endangered plant species on Maui and Kaho'olawe. Section 4(b)(2) of the Endangered Species Act (the Act) requires the Service to designate critical habitat on the basis of the best scientific and commercial data available after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. The Service may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of including the areas within critical habitat, provided the exclusion will not result in extinction of the species.

The focus of this economic analysis is on section 7(a)(2) of the Act, which requires Federal agencies to insure that any action authorized, funded, or carried out by the Federal government is not likely to *jeopardize* the continued existence of any endangered or threatened species or result in the destruction or *adverse modification* of critical habitat. Federal agencies are required to consult with the Service whenever they propose a discretionary action that may affect a listed species or its designated critical habitat. Aside from the protection that is provided under section 7, the Act does not provide other forms of protection to lands designated as critical habitat. Because consultation under section 7 only applies to activities that involve Federal permits, funding or involvement, the designation of critical habitat will not afford any additional protections under the Act with respect to strictly private activities. This analysis does not address impacts associated with implementation of other sections of the Act.

2. PROPOSED CRITICAL HABITAT DESIGNATION

The Service is proposing 13 critical habitat units on Maui and two units on Kahoʻolawe. Five of the units on Maui are divided into 18 subunits. Thus, the total number of units and subunits on Maui and Kahoʻolawe is 28. Combined, these units cover approximately 145,514 acres, much of which are in uninhabited or sparsely inhabited remote areas.[1]

[1] This acreage estimate overstates the actual critical habitat acreage because it includes "unmapped holes," including the Haleakala High Altitude Observatory Site and the existing manmade features and structures discussed in Chapter I, Section 2.b.

3. ECONOMIC IMPACTS

For the most part, implementation of the section 7 listing and critical habitat provisions of the Act on the areas proposed for critical habitat would have modest economic impacts for the following reasons:

— As modified[2], none of the units contains significant military, residential, commercial, industrial or golf-course projects; crop farming; or intensive livestock operations. Furthermore, over the next 10 years, few projects are planned for locations in the proposed critical habitat. This situation reflects the facts that (1) much of the land is unsuitable for development or other economic activities due to the rugged mountainous terrain, lack of access, and remote locations; and (2) most of the land proposed for critical habitat is in the Conservation District where development and most other economic activities are severely limited.

— Some existing and continuing activities involve the operation and maintenance of existing man-made features and structures. These are not subject to the critical habitat provisions of section 7 because they do not contain the *primary constituent elements* for the plants, and therefore would not be impacted by the designation.

— Some existing and planned projects, land uses, and activities that could affect the proposed critical habitat units have no *Federal involvement* that would require section 7 consultation with the Service, so they are not restricted by the requirements of the Act.

— For the anticipated projects and activities that will have *Federal involvement,* many are conservation efforts that will not negatively impact the plants or their habitat and many have already been consulted on prior to the proposed designation, so they will be subject to the minimal level of informal section 7 consultation.

For various economic activities in the proposed critical habitat, Table ES-1 presents estimates of (1) the direct and indirect costs and benefits attributable to the section 7 provisions of the Act that are associated with listing the plants as threatened and endangered species *and* with designating critical habitat for the plants, and (2) that portion of the costs and benefits which is solely attributable to the critical habitat designation.

Over a 10-year time period, the total estimated section 7-related costs associated with the plant species listings, plus the indirect cost to investigate the implications of critical habitat, are $471,700 to $2,379,600, while those attributable solely to the critical habitat designation are $310,000 to $2,095,500. These costs represent, in the worst case, about .08 percent of the total

[2] The Service has indicated that the final rule for the critical habitat will feature (1) remapped boundaries that exclude large areas which do not contain *primary constituent elements*, and (2) an expanded list of man-made features and structures that do not contain *primary constituent elements* (Memorandum to the Service, Washington Office, from the Service, Honolulu Field Office. July 2, 2002).

personal income of Maui County in 1999. In addition, although not subject to accurate quantification, other indirect costs could add to the totals. The speculative nature of the indirect costs and impossibility of assigning probabilities to their occurrences make it impossible to fix an expected value for these indirect costs. However, based on this analysis, the proposed critical habitat designation will not have a significant economic impact on a substantial number of small entities.

Designation of the proposed critical habitat and related actions taken to control threats to the plant species (e.g., ungulate control) may also generate economic benefits. These benefits may be related directly or indirectly to designation and manifest in increased regional economic activity or social welfare. For the former, to the extent that critical habitat designation leads to additional conservation management activities funded by out-of-state sources, a local increase in revenues and employment may result. For the latter, species preservation and recovery and other complementary ecological improvements may generate social welfare benefits for residents and non-residents alike. However, the development of quantitative estimates associated with the benefits of the proposed designation is impeded by the scarcity of available studies and information relating to the size and value of beneficial changes that are likely to occur as a result of listing a species or designating critical habitat. In particular, the following information is not currently available: 1) quantified data on the value of the Maui and Kaho‘olawe species; and 2) quantified data on the change in the quality of the ecosystem and the species as a result of the designation (for example, how many fewer ungulates will roam into the critical habitat, how many fewer invasive plants will be introduced as a result, and therefore how many more of the endangered plants will be present in the area). As a result, it is not possible, given the information that is currently available, to estimate the value associated with ecosystem preservation that could be ascribed to critical habitat designation or to estimate the probability that certain benefit will occur. Thus, categories of benefits are discussed in qualitative terms. It is not intended to provide a comprehensive analysis of the benefits that could result from section 7 of the Act in general, or of critical habitat designation in particular. In short, the Service believes that the benefits of critical habitat designation are best expressed in biological terms that can be weighed against the expected costs of the rulemaking.

Table ES-1. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat

(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

Item	Total		Share to CH		Explanation
	Low	High	Low	High	
DIRECT SECTION 7 COSTS					
Management of Game Hunting					
State-Managed Lands, Consultations	$ 4,100	$ 12,700	$ 1,200	$ 5,800	Consultation due to Pittman-Robertson funding
State-Managed Lands, PMs	$ 115,500	$ 185,000	$ 92,400	$ 148,000	Based on prior PMs
National Parks					
Haleakala National Park, Consultation for Fencing project	$ 11,500	$ 11,500	$ 7,700	$ 7,700	Consultation due to National Park Service involvement
Haleakala National Park, Fencing PMs	None	None	None	None	PMs, if any, would be minor due to beneficial nature of project
Haleakala National Park, Consultation for Trail Improvement project	$ 11,500	$ 11,500	$ 7,700	$ 7,700	Consultation due to National Park Service involvement
Haleakala National Park, Trail improvement PMs	Minor	Minor	Minor	Minor	PMs, if any, would be minor since the project will be primarily located within the existing footprint of the trail
State Parks and Trails					
Wai'anapanapa State Park, Consultation	$ 19,400	$ 19,400	$ -	$ -	Consultation due to possible NPS funding
Wai'anapanapa State Park, PMs	None	None	None	None	No PMs expected since the park already is subject to
Polipoli Spring State Recreational Area, Consultation	$ 8,900	$ 19,400	$ 8,900	$ 19,400	Consultation due to possible NPS funding
Polipoli Spring State Recreational Area, PMs	Minor	Minor	Minor	Minor	PMs, if any, would be minor since the project will be in already disturbed area.
Na Ala Hele Trail and Access System, Consultations	None	None	None	None	No known Fed involvement
Department of Hawaiian Home Lands					
Kahikinui , Consultations	$ 15,700	$ 78,500	$ 15,700	$ 78,500	Consultations due to Fed funding
Kahikinui PMs	None	None	None	None	
Pu'u o Kali, Consultations	None	None	None	None	No projects planned in CH and no Fed involvement
Kaho'olawe					
Kaho'olawe, Consultations	$ 10,400	$ 78,500	$ 10,400	$ 78,500	Consultations due to possible Fed funding
Kaho'olawe, PMs	Minor	Minor	Minor	Minor	PMs, if any, would be minor due to the beneficial nature of the activities
Conservation Projects					
West Maui Mountains Watershed Partnership, Consultations	$ 44,600	$ 60,300	$ 23,700	$ 34,200	Consultation due to likely Fed funding
West Maui Mountains Watershed Partnership, PMs	None	None	None	None	
East Maui Watershed Partnership, Consultations	$ 44,600	$ 60,300	$ 23,700	$ 34,200	Consultation due to possible Service funding
East Maui Watershed Partnership, PMs	None	None	None	None	
Kanaio Natural Area Reserve, Consultation	$ 10,100	$ 20,600	$ -	$ -	Consultation due to possible Service funding
Kanaio Natural Area Reserve, PMs	None	None	None	None	
Other Conservation, Consultation	$ 15,700	$ 62,800	$ 10,500	$ 42,000	Consultation due to possible Service or NRCS funding
Other Conservation, PMs	None	None	None	None	

Table ES-1. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat

(10-year estimates)
(continued)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

Item	Total		Share to CH		Explanation
	Low	High	Low	High	
DIRECT SECTION 7 COSTS (cont'd)					
Agriculture and Ranching Operations					
Federally-sponsored operations, consultations	$ 31,400	$ 164,800	$ 21,000	$ 92,000	Consultation due to Fed funding
EQIP or CRP funded projects, PMs	$ -	$ 400,000	$ -	$ 400,000	PMs could involve foregoing Fed funding
Electric Generation and Delivery					
Kaheawa Pastures 20 MW Windfarm, Consultation	$ 19,600	$ 19,600	$ 19,600	$ 19,600	Consultation due to FAA permit
Kaheawa Pastures 20 MW Windfarm, PMs	$ -	$ 150,000	$ -	$ 150,000	Could involve moving the site, additional botanical survey and other preservation measures
Communications Facilities					
Hawaii Television Broadcasters Association Antennae, Consultation	$ 27,100	$ 40,300	$ -	$ 40,300	Consultation due to FCC permit and possible FAA permit and Fed funding
Hawaii Television Broadcasters Association Antennae, PMs	$ -	$ 150,000	$ -	$ 150,000	Could involve moving the site, additional botanical survey and other preservation measures
New Facilities, Consultations	$ 8,900	$ 39,200	$ -	$ 39,200	Consultation due to FCC and/or FAA permits
New Facilities, PMs	$ -	$ 200,000	$ -	$ 200,000	Could include moving the site
Residential Development					
Potential Development within Agricultural District, Consultations	None	None	None	None	No projects planned in CH and no known Fed involvement
Water Systems					
Water improvement projects, Consultations	$ -	$ 68,000	$ -	$ 26,400	Possible water infrastructure construction with Fed funding
Water improvement projects, PMs	$ -	$ 200,000	$ -	$ 200,000	Could involve moving the site
Military Activities					
Hawai'i Army National Guard, Consultations	$ 15,700	$ 15,700	$ 10,500	$ 10,500	Consultation due to Fed funding
Hawai'i Army National Guard, PMs	Minor	Minor	Minor	Minor	Minor PMs due to already established NRMP with input from the Service
U.S. Military, Consultations	None	None	None	None	No planned military activity in CH
Roads, Consultations	None	None	None	None	No projects planned in CH
Ecotourism, Consultations	None	None	None	None	No known Fed involvement
Natural Disasters					
Recovery Projects, Consultations	$ 4,000	$ 7,500	$ 4,000	$ 7,500	Consultation due to FEMA funding
Recovery Projects, PMs	Minor	Minor	Minor	Minor	Few adverse impacts anticipated

Table ES-1. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat

(10-year estimates)
(continued)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

Item	Total		Share to CH		Explanation
	Low	High	Low	High	
INDIRECT COSTS *					
Management of Game Mammals and Loss of Hunting Lands	Minor	Minor	Minor	Minor	Slight probability of a major impact
Conservation Management	Minor	Minor	Minor	Minor	No obligation to proactively manage lands to control threats, but an undetermined probability of a major impact
Subsistence and Native Hawaiian Traditional and Cultural Practices	Minor	Minor	Minor	Minor	Undetermined, but slight, probability of a moderate impact
Redistricting of Land by the State	Small	Small	Small	Small	Small probability of significant impacts
State and County Development Approvals	Modest	Modest	Modest	Modest	Few anticipated projects, but costs to projects range from insignificant to substantial
Reduced Property Values	Small	Small	Small	Small	Small probability of significant impacts
Condemnation of Property	None	None	None	None	No condemnation resulting from CH. Also, the Service acquires land by negotiation, not condemnation
Investigate Implications of CH	$ 53,000	$ 304,000	$ 53,000	$ 304,000	32 private landowners may investigate the implications of CH on their lands
Reduced Cooperation on Conservation Projects	Modest	Modest	Modest	Modest	Some landowners want to avoid CH designation
TOTAL COSTS					
Direct	$ 418,700	$ 2,075,600	$ 257,000	$ 1,791,500	
Indirect	$ 53,000	$ 304,000	$ 53,000	$ 304,000	
Direct and Indirect	$ 471,700	$ 2,379,600	$ 310,000	$ 2,095,500	
Discounted Present Value	$ 331,302	$ 1,671,331	$ 217,731	$ 1,471,792	Present value and annualized calculations are based on the OMB prescribed seven percent discount rate and the assumption that total costs are distributed evenly over the entire period of analysis.
Annualized	$ 47,170	$ 237,960	$ 31,000	$ 209,550	

*** Although the analysis does provide general estimates of some of the potential indirect costs shown below, not all of the estimates are summarized in this table. Because some of these indirect costs are highly speculative, this table instead reports qualitatively on their likelihood and magnitude. For additional information on any of these indirect impacts, the reader should refer to the economic cost and benefit chapter of the analysis. Only those costs deemed more likely to occur are included in this summary table in order to present the most probable overall impact of critical habitat designation.**

Table ES-1. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat

(10-year estimates)
(continued)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

Item	Total		Share to CH		Explanation
	Low	High	Low	High	
DIRECT BENEFITS					
Regional Economic Activity Associated with Medical/Pharmaceutical Benefits	Minor	Minor	Minor	Minor	No way to determine statistical probability or economic value of future medicinal use or contribution of critical habitat.
Regional Economic Activity Generated by Conservation Management	Minor	Minor	Minor	Minor	Much of the benefit likely accrued elsewhere if financed with off-island sources
Regional Economic Activity Associated with Ecotourism	Minor	Minor	Minor	Minor	The Service prefers that guides do not feature visits to endangered plants
Regional Economic Activity Associated with Avoided Cost to Developers	Minor	Minor	Minor	Minor	Helps developers site projects
Social Welfare Benefits of Habitat Designation	Minor	Minor	Minor	Minor	The designation may result in preservation of open lands
INDIRECT BENEFITS					
Social Welfare Benefits of Endangered Species Preservation	ne	ne	ne	ne	Difficult to estimate preservation benefits and their value
Social Welfare Benefits of Broader Ecological Improvements	ne	ne	ne	ne	Difficult to determine environmental improvements attributable to the implementation of section 7

THE LISTED PLANTS AND PROPOSED CRITICAL HABITAT[3] CHAPTER I

Under the Endangered Species Act of 1973, as amended (the Act), the United States Department of the Interior, Fish and Wildlife Service (the Service) proposes to designate critical habitat for threatened and endangered plant species on the islands of Maui and Kahoʻolawe in Hawaiʻi. This chapter provides information on the listed plants and the proposed critical habitat units, most of which comes from the document "Endangered and Threatened Wildlife and Plants; Revised Determinations of Prudency and Proposed Designations of Critical Habitat for the Plant Species From the Island of Maui and Kahoʻolawe, Hawaiʻi" (the proposed rule), published in the *Federal Register* on April 3, 2002 (67 FR 15855). In addition, the Service provided valuable information for this chapter in the form of overlay resource maps and detailed acreage data.

1. THE LISTED PLANTS

The Service proposes critical habitat for 61 threatened and endangered plant species on Maui and Kahoʻolawe. The proposed rule contains a detailed discussion of the plant taxa, including taxonomy, ecology, habitat requirements, historical and current distribution and threats for each of these species.

2. PROPOSED CRITICAL HABITAT UNITS

The Service is proposing 13 critical habitat units on Maui and two units on Kahoʻolawe. Five of the units on Maui are divided into 18 subunits. Thus, the total number of units and subunits (referred to throughout this report as "units") on Maui and Kahoʻolawe is 28. Based on the proposed rule and other sources, this chapter and Table I-1 provide information on the units, including the *primary constituent elements* essential for the conservation of each plant species, their general location and terrain, excluded features and structures, acreages, land ownership, existing land management, and existing improvements and activities in the units. The proposed rule provides detailed information on the critical habitat boundaries and the map coordinates of boundary points.

[3] Note to Reader: After learning about the proposed critical habitat in this chapter, readers who are already familiar with Maui County (Chapter II), the Act (Chapter III), existing protections (Chapter IV), or the methodology for conducting the economic analysis (Chapter V) may wish to skip these chapters, as appropriate, and proceed to the analysis of economic impacts (Chapter VI).

2.a. Primary Constituent Elements

Each of the proposed critical habitat units provides one or more of the *primary constituent elements* essential for the conservation of the plant species. The Service defines *primary constituent elements* on the basis of the habitat features of the areas where the plant species are reported. Habitat features include the type of plant community, associated native plant species, locale (e.g., steep rocky cliffs, talus slopes, stream banks), and elevation.

2.b Excluded Features and Structures

As indicated in the proposed rule, existing manmade features and structures do not contain, and are not likely to develop, *primary constituent elements*. As a result, the Service considers these features and structures to be excluded from the proposed critical habitat as "unmapped holes." Some of the "unmapped holes" the Service has identified span a large area of the designation and can be excluded by remapping boundaries. Specifically, Haleakala High Altitude Observatory Site in Units H and I1 lacks primary constituent elements and is therefore excluded. The site covers approximately 18 acres on the summit of Haleakala National Park. The area is occupied by the Maui Space Surveillance Complex, and observatories and supporting infrastructure, including the Mees Solar Observatory, the Lunar Ranging Experiment Observatory, and the newly constructed Faulkes Observatory.[4]

On the other hand, some of the existing manmade features and structures are small and cannot easily be excluded by remapping boundaries. The operation and maintenance of these manmade features and structures generally would not be impacted by critical habitat designation. In addition to such manmade features and structures listed in the proposed rule, the Service has identified additional ones. Below is the modified list of excluded manmade features and structures:

- Hiking trails (Units A, B1, F, G6, H, I1, I2, I3, I4, J)
- Campgrounds (Units I4, J)
- Lookouts (Units I1, J)
- Water infrastructure, including wells, tanks, tunnels, pipelines, ditches, reservoirs, pumping stations, and gaging stations (Units A, B1, B2, C4, D1, H, I4, J, L)
- Additional cultural features such as rock walls, platforms, burials, shrines (Unit J)
- Remote helicopter landing sites (Units J, K)
- Fences (Units A, J, L)
- Buildings (Units H, I1, J)
- Roads (Units A, B1, B2, C3, D1, E, H, I1, I3, I4, J, L)
- Aqueducts (Unit A)
- Telecommunications equipment, radars, telemetry equipment, missile launch sites (Units H, I1)

[4] The Service indicates that the final rule for the critical habitat will feature remapped boundaries that exclude this larger area that lacks *primary constituent elements* (Memorandum to the Service, Washington Office, from the Service, Honolulu Field Office. July 2, 2002)

At the bottom of Table I-1, the section entitled "Improvements/Activities" indicates which of these features are associated with each unit.

Because these manmade features and structures are excluded from the proposed designation, they are also excluded from this economic analysis. Henceforth, references to the proposed critical habitat already exclude all features and structures discussed above unless indicated otherwise by footnotes.

2.c Acreage[5]

As shown in Table I-1, the total acreage proposed for critical habitat designation on Maui and Kaho'olawe is 145,514 acres. The acreage encompassed within the boundaries of the 13 proposed critical habitat units on Maui total approximately 126,531 acres, which is about 27 percent of the island. The acreage for the two units on Kaho'olawe total approximately 18,983 acres, which is about 67 percent of the island.

2.d Location and Terrain

Significant portions of the acreage in Maui are in uninhabited or sparsely inhabited remote areas:

- All or large portions of proposed Units A, B, D and M are in the West Maui Watershed characterized by steep mountain ridges, high slopes and steep gulches.
- Most of proposed Units K and L are in the East Maui Watershed and are characterized by steep mountain ridges, high slopes and steep gulches.
- Proposed Units C and G are located on steep sea cliffs along the northwest and northeast shores, respectively.
- Proposed Unit F is located on the south shore of east Maui and is the site of former lava flows.

Other units are relatively more accessible and subject to limited human use, including hiking and grazing. However, due to their remoteness from population centers and rugged terrain, they remain sparsely inhabited by permanent residents:

- Proposed Unit J contains the summit and crater of Haleakala and includes steep cliffs and high slopes.
- Proposed Units I1, I2, I3 and I4 are located on the upper western slope of Haleakala and contain forests and pasture land.

[5] These acreage estimates overstate the actual critical habitat acreage because they include "unmapped holes," including the Haleakala High Altitude Observatory Site and the existing manmade features and structures discussed in Chapter I, Section 2.b.

— Proposed Unit E is located on the lower western slope of Haleakala between Kula and Kihei and is characterized by rugged terrain.

— Proposed Unit H is located on the lower southern flank of Haleakala and is a dry, remote area with rugged terrain.

Kaho‘olawe is an uninhabited island with limited access. Unit A covers most of the island, including the shoreline, sea cliffs and deep gulches, but excluding the central elevation. Unit B is an islet off the southern coast of Kaho‘olawe.

Detailed maps appear in the proposed rule.

2.e *Occupied* and *Unoccupied* Units

The Service considers about 25,813 acres (18 percent) of the proposed critical habitat on Maui and Kaho‘olawe to be *occupied* by the listed plant species and 119,701 acres (82 percent) to be *unoccupied.* The *unoccupied* areas were included in the proposed designation because the Service believes that they are necessary to provide for the long-term survival and conservation of the species.[6]

2.f Land Ownership

Approximately 21,808 acres (15 percent) proposed as critical habitat are owned by the Federal government. Of this, 21,784 acres are on Maui (17 percent of the area proposed on Maui) and 24 acres are on Kaho‘olawe (less than one percent of the area proposed on Kaho‘olawe). The State owns about 76,423 acres (53 percent) of the area. Of this, 57,476 acres are on Maui (45 percent of the area proposed on Maui) and 18,947 acres are on Kaho‘olawe (99.8 percent of the area proposed on Kaho‘olawe). The remaining 47,266 acres (32 percent) are owned by major private landowners (the Service defines “major landowners” as owners of at least 500 acres in Hawai‘i). All of this land is located on Maui and makes up 37 percent of the area proposed for designation on Maui.

2.g Existing Land Management

Land in the proposed critical habitat is subject to a variety of existing regulations and land-management programs that already limit activities in those areas. These include Federal programs, State land-use controls and programs, county land-use controls and land management by various public and private organizations. The regulations and land-management programs are described in Chapter IV.

Table I-1 at the end of this chapter identifies, by critical habitat unit, the amount of acreage under each type of control or management. Since some of the managed areas overlap with one another (e.g., portions of State Hunting Units are in State Forest Reserves), the percentages in Table I-1 do not always sum to 100 percent.

[6] These acreage estimates overstate the actual critical habitat acreage because it includes “unmapped holes,” including the Haleakala High Altitude Observatory Site and the existing manmade features and structures discussed in Chapter I, Section 2.b.

As indicated in the table, approximately 21,346 acres (15 percent) of the proposed critical habitat are controlled by Federal government as part of Haleakala National Park. At the State level, about 80 percent of the proposed critical habitat is in the State Conservation District. The Conservation District is subject to State control or management, and development and commercial activity is generally limited within the Conservation District with varying levels of restrictions based on the applicable Subzone (see Chapter IV for full discussion).

In addition to the State restrictions that are placed on land in the Conservation District, some of this land is managed by the State as follows: approximately 24,812 acres (17 percent of the proposed designation) are in State Forest Reserves; 18,970 acres (13 percent) are in the Kahoʻolawe Island Reserve; 7,054 acres (five percent) are in State Natural Area Reserves (NARs); 51 acres (less than 0.1 percent) are in a State Plant Sanctuary; and one acre is in a State Park. Approximately 32,000 acres (22 percent of the proposed designation) are in State Hunting Units, large areas managed for public hunting. (See Chapter IV for full discussion of State Forest Reserves, Kahoʻolawe Island Reserve, NARS, State Parks and State Hunting Units).

While the State manages land in the Conservation District, the County of Maui has primary responsibility for land in the other districts--namely, the Agricultural, Urban and Rural Districts. These three Districts are subject to county land-use and development controls, including county community plans, zoning, and building code regulations affecting farm, residential, commercial, and industrial development and use. Of the proposed critical habitat designation, approximately 29,175 acres (20 percent of the proposed designation) are in the Agricultural District and none are in the Rural or Urban Districts. In Special Management Areas (SMAs) located along the shoreline, the county has an additional layer of regulation that provides special control on development, even for land already subject to Conservation District restrictions (see Chapter IV for full discussion).

Approximately 27,064 acres proposed for critical habitat (19 percent) are privately managed under cooperative agreements as part of the West Maui Mountains Watershed Partnership and the East Maui Watershed Partnership or are managed by the Nature Conservancy under the Natural Area Partnership program (Kapunakea Preserve and Waikamoi Preserve) (see Chapter IV for full discussion).

Table I-1. Critical Habitat Units, Maui Plants: Acreage, Location, Ownership, Land Management, Improvements and Activities

Item	Units	All Units		Unit A	Unit B1	Unit B2	Unit C1	Unit C2	Unit C3	Unit C4	Unit D1	Unit D2	Unit E	Unit F	Unit G1	Unit G2	Unit G3	Unit G4	Unit G5
		Total	Share																
Total Area*	Acres	145,515		9,598	10,808	893	56	24	400	400	17,175	523	3,432	357	10	2	16	53	77
Area Occupied by Listed Plants	Acres	25,813		2,747	2,070	-	-	-	193	185	5,321	211	687	140	-	2	-	29	47
Land Ownership																			
Federal	Acres	21,808	15%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
State	Acres	54,933	38%	3,170	2,909	9	-	-	187	212	7,885	-	-	357	-	2	16	-	41
State DHHL	Acres	21,491	15%	-	-	-	-	-	-	-	-	-	2,051	-	-	-	-	13	-
County	Acres	5	<1%	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-
Private, Major Owner	Acres	46,830	32%	6,390	7,899	884	56	24	209	76	9,289	494	1,380	-	10	-	-	26	20
Private, Small Owners	Acres	436	<1%	38	-	-	-	-	0.3	113	-	29	-	-	-	-	-	14	17
State/County Roads	Acres	11	<1%	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
Federally Controlled or Managed																			
National Park	Acres	21,346	15%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Military	Acres	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FWS, non-plant populations	Count	-	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
State Controlled or Managed																			
Conservation District	Acres	116,343	80%	7,940	10,808	775	56	24	397	204	16,891	296	-	357	9	2	16	36	76
Forest Reserves	Acres	24,812	17%	852	234	7	-	-	-	-	6,285	-	-	-	-	-	-	-	0
Hunting Area	Acres	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Natural Area Reserves (NARs)	Acres	7,054	5%	1,944	2,657	-	-	-	-	-	1,510	-	-	-	-	-	-	-	-
State Plant Sanctuary	Acres	51	<1%	-	-	-	-	-	-	-	51	-	-	-	-	-	-	-	-
State Parks	Acres	1	<1%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
County-Controlled or Managed																			
Agricultural District	Acres	29,175	20%	1,658	-	118	-	-	3	196	283	227	3,432	-	1	-	1	17	2
Urban	Acres	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rural	Acres	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Special Management Areas	Present	N/A	N/A	-	-	-	yes	yes	yes	yes	-	-	-	yes	yes	yes	yes	yes	yes
Board of Water Supply	Acres	1,860	1%	-	1,860	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-
Private-Controlled or Managed																			
Private managed lands	Acres	27,027	19%	4,569	6,024	11	-	-	-	-	8,921	158	-	-	-	-	-	-	-
Private preserve	Acres	37	<1%	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Improvements/Activities																			
Paved Roads	Count	9	N/A	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Unpaved Rds or 4-wd Trails	Count	37	N/A	2	1	1	-	-	-	-	5	-	2	-	-	-	-	-	-
Hiking Trails	Count	19	N/A	2	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-
Communication Complexes	Count	3	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Water Improvements	Count	38	N/A	6	1	1	-	-	-	3	12	-	-	-	-	-	-	-	-
Spring	Count	7	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reservoir	Count	1	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Structures	Count	7	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Military Grounds	Present	N/A	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hunting, State-Managed Lands	Present	N/A	N/A	yes	yes	yes	-	-	-	-	yes	-	-	-	-	-	-	-	-
Farming	Present	N/A	N/A	yes	-	-	-	-	-	-	yes	-	-	-	-	-	-	-	-
Grazing	Present	N/A	N/A	-	-	-	-	-	yes	yes	-	-	yes	-	yes	-	-	yes	yes

Note: Entries may not sum to totals due to rounding, slight acreage discrepancies, and overlapping land-management areas.

*This acreage estimate overstates the actual critical habitat acreage because it includes "unmapped holes," including the Haleakala High Altitude Observatory Site and the existing manmade features and structures discussed in Chapter I, Section 2.b.

Table I-1. Critical Habitat Units, Maui Plants: Acreage, Location, Ownership, Land Management, Improvements and Activities (continued)

Item	Units	Unit G6	Unit H	Unit I1	Unit I2	Unit I3	Unit I4	Unit J	Unit K	Unit L	Unit M	Kaho'olawe Unit A	Kaho'olawe Unit B
Total Area*	Acres	27	34,843	4,601	1,680	1,117	1,227	14,308	13,502	11,396	6	18,972	12
Area Occupied by Listed Plants	Acres	26	4,314	216	447	666	401	2,529	2,334	2,828	6	402	12
Land Ownership													
Federal	Acres	-	641	1,391	-	-	-	14,287	5,163	302	-	24	-
State	Acres	27	5,905	1,676	437	697	239	-	8,339	3,860	6	18,947	12
State DHHL	Acres	-	19,427	-	-	-	-	-	-	-	-	-	-
County	Acres	-	-	-	-	-	-	-	-	-	-	-	-
Private, Major Owner	Acres	-	8,821	1,534	1,059	420	986	21	-	7,232	-	-	-
Private, Small Owners	Acres	-	41	-	183.0	-	-	-	-	1	-	-	-
State/County Roads	Acres	-	8	-	-	-	3	-	-	-	-	-	-
Federally Controlled or Managed													
National Park	Acres	-	639	1,389	-	-	-	14,297	4,704	317	-	-	-
Military	Acres	-	-	-	-	-	-	-	-	-	-	-	-
FWS, non-plant populations	Count	-	-	-	-	-	-	-	-	-	-	Present	-
State Controlled or Managed													
Conservation District	Acres	27	14,191	4,584	437	697	447	14,308	13,419	11,356	6	18,972	12
Forest Reserves	Acres	-	2,233	1,529	437	697	239	-	8,436	3,862	-	-	-
Hunting Area	Acres	-	-	-	-	-	-	-	-	-	-	-	-
Natural Area Reserves (NARs)	Acres	-	943	-	-	-	-	-	0	0	-	-	-
State Plant Sanctuary	Acres	-	-	-	-	-	-	-	-	-	-	-	-
State Parks	Acres	1	-	-	-	-	-	-	-	-	-	-	-
County-Controlled or Managed													
Agricultural District	Acres	-	20,653	17	1,243	420	781	-	83	40	-	-	-
Urban	Acres	-	-	-	-	-	-	-	-	-	-	-	-
Rural	Acres	-	-	-	-	-	-	-	-	-	-	-	-
Special Management Areas	Present	yes	yes	-	-	-	-	-	-	-	-	yes	yes
Board of Water Supply	Acres	-	-	-	-	-	-	-	-	-	-	-	-
Private-Controlled or Managed													
Private managed lands	Acres	-	-	131	-	-	-	-	-	7,213	-	-	-
Private preserve	Acres	-	-	0	-	-	-	11	-	4	-	-	-
Improvements/Activities													
Paved Roads	Count	-	3	2	-	1	-	-	-	2	-	-	-
Unpaved Rds or 4-wd Trails	Count	-	16	1	-	-	3	-	-	1	-	5	-
Hiking Trails	Count	1	-	2	3	2	-	6	-	-	-	N/A	N/A
Communication Complexes	Count	-	1	2	-	-	-	-	-	-	-	-	-
Water Improvements	Count	-	10	-	-	-	1	1	-	3	-	-	-
Spring	Count	-	-	-	-	-	3	1	2	1	-	-	-
Reservoir	Count	-	-	-	-	-	-	-	-	1	-	-	-
Other Structures	Count	-	-	-	-	-	-	-	-	-	-	7	-
ilitary Grounds	Present	-	yes	-	-	-	-	-	-	-	-	-	-
Managed Lands	Present	-	yes	yes	yes	yes	-	-	yes	yes	-	-	-
Farming	Present	-	yes	-	-	-	-	-	-	-	-	-	-
Grazing	Present	-	yes	-	yes	yes	yes	-	-	-	-	-	-

Note: Entries may not sum to totals due to rounding, slight acreage discrepancies, and overlapping land-management areas.

*This acreage estimate overstates the actual critical habitat acreage because it includes "unmapped holes," including the Haleakala High Altitude Observatory Site and the existing manmade features and structures discussed in Chapter I, Section 2.b.

PHYSICAL AND SOCIOECONOMIC PROFILE OF MAUI COUNTY[7] CHAPTER II

To provide context for evaluating the economic impacts of the proposed critical habitat designation, this chapter presents (1) physical descriptions of the main islands of Maui County (Maui, Moloka‘i, Lana‘i and Kaho‘olawe); and (2) socioeconomic profiles of Maui County and each of the main islands. A summary of the socioeconomic data is presented in Table II-1.

1. PHYSICAL DESCRIPTIONS OF THE ISLANDS OF MAUI COUNTY

The four main islands and smaller islets of Maui County are situated in the middle of the main portion of the Hawaiian chain. O‘ahu lies to the northwest and the Big Island of Hawai‘i lies to the southeast. Less than a million years ago, the four islands of Maui County were physically connected—that once-single island is sometimes referred to today as “Maui Nui.”

1.a. Island of Maui

Maui, the second largest of the eight major islands, is 48 miles long, 26 miles wide, and 728 square miles in area. It was formed from the remnants of two large shield volcanos connected by an isthmus that drops to an elevation of less than 130 feet in the middle of the saddle.

The older West Maui Mountains (at 1.3 million years) are heavily eroded by streams that have cut deep valleys and ridges into the original volcano and have limited access to many of the interior regions. The highest point on West Maui is Pu‘u Kukui at 5,788 feet, where the average rainfall is 400 inches per year. This is the second wettest spot in Hawai‘i. Typical of older and eroded areas, West Maui hosts highly diverse regional flora.

Dominating East Maui is the 10,023-foot massive volcano Haleakala (“House of the Sun”). Haleakala retains its classic shield shape due to its comparative geological youth (750,000 years). It is considered to be an active volcano, although the last summit eruption occurred 800 to 1,500 years ago, and the last flank eruption occurred in about 1790. Average annual rainfall on Haleakala exceeds 300 inches a year on the windward (northeast) side of the mountain at about the 2,000- to 3,000-foot elevation; about 35 inches at the summit; and less than 30 inches on the dry leeward (south) side. Summit rainfall is low because the trade wind inversion (at about the 7,000-foot elevation) impedes the moisture-laden trade winds from reaching higher elevations. The sizable

[7] **Note to Reader:** Readers who are already familiar with Maui County may wish to skip this chapter and proceed to the next background-information chapters (Chapters III through V), or to the economic analysis (Chapter VI).

summit crater (7.5 miles long and 2.5 miles wide) is a dry cinder desert. Haleakala does not exhibit the diverse vegetation of the older West Maui Mountains.

1.b. Island of Moloka'i

Molokaʻi is the fifth largest of the main Hawaiian islands at 38 miles long, up to 17 miles wide, and 266 square miles in area. It was formed from the coalescence of two large shield volcanoes and one much smaller volcano.

West Molokaʻi, the older of the two large volcanoes (at 1.9 million years), is very flat, rising to only 1,381 feet with an east-west extent of about 12 miles. This elevation is insufficient to check the blustery trade winds or induce orographic rainfall. As a result, windy and dry (15 to 40 inches rainfall per year) conditions prevail, and coastal and inland sand dunes extend almost completely across the northwestern corner of West Molokaʻi. In this area, cattle and goats were introduced beginning in the 1800s. Subsequently, these ungulates overgrazed a former forest, resulting in severe erosion.

East Molokaʻi is a slightly younger volcano (1.8 million years) and much larger. It measures 27 miles east to west and eight miles north to south. The eroded East Molokaʻi Mountains comprise about two-thirds of the east-west extent of the island. They are dominated on the north coast by precipitous sea cliffs rising more than 3,600 feet—the tallest sea cliffs in the world. Also, three amphitheater-headed valleys open to the windward (north) coast, their ridges converging on the island's summit at Kamakou (4,970 feet). Rainfall on the windward side varies from 75 inches to more than 160 inches per year. The gulch-scored leeward slopes of East Molokaʻi descend to a narrow coastal plain on the south side of the island. Certain areas in the East Molokaʻi Mountains are accessible via four-wheel-drive vehicle. Foot trails provide access to portions of the mountainous interior, but many areas have difficult access.

Between these two volcanoes lies the Molokaʻi isthmus, commonly referred to as the Hoʻolehua Plain. This area was formed when lava flowing from the East Molokaʻi volcano overlapped the West Molokaʻi shield.

The third distinctive volcano forms the four-square-mile Kalaupapa Peninsula on the north central coast. Windward cliffs 1,600 feet high and negotiable only on foot or by mule separate Kalaupapa from the rest of the island. Kalaupapa Peninsula receives 40 to 50 inches of rain a year.

1.c Island of Lanaʻi

Lanaʻi, the smallest of the inhabited main Hawaiian islands, is 13 miles long, 13.3 miles wide, and 139 miles square. It was formed from a single dome-shaped shield volcano that last erupted 1.3 million years ago and now has a maximum elevation of 3,370 feet at its summit, Lanaʻihale.

Lanaʻi is sheltered from the wind by the much larger island of Maui, putting it in a rain-shadow during trade-wind weather. Rainfall on Lanaʻi is uncharacteristically low for Hawaiʻi, ranging from just 35 inches annually near Lanaʻihale to less than 10 inches in the southwestern part of the island. Lanaʻi has no perennial streams or lakes, and the sustainable groundwater yield is estimated at just six million gallons per day.

Because the northeastern (windward) coast of the island is sheltered from ocean forces and wave erosion, it is fringed with broad expanses of sandy beaches and sediment, with no appreciable sea cliffs. On the other hand, the southwest (leeward) coast is exposed to wave erosion from southwesterly storms, resulting in high sea cliffs. On the southeastern coast, strong winds have blown beach sand to form a 10- to 20-foot ridge of dunes.

1.d. Island of Kahoʻolawe

Kahoʻolawe lies 6.7 miles off the south coast of Maui. It is the smallest of the eight main islands, measuring 10.9 miles long, 6.4 miles wide, 45 square miles in area, and 1,477 feet at its highest point. Formed from the summit of a single volcanic dome, it is one of the older islands in the Hawaiian group. Also, it is arid, having the lowest rainfall of all the main islands. This is due to the combination of its low relief and its position in the lee of towering Haleakala. Annual rainfall averages about 25 inches on its eastern slopes, while the southwestern side of the island receives considerably less rain. By the early 1900s and continuing into the 1990s, overgrazing by goats reduced vegetation, and strong trade winds blew away vast quantities of soil. The landscape suffered further degradation during the approximately 50 years that the military used the island as a target for naval and aerial bombardment training, discussed below.

2. SOCIOECONOMIC PROFILE OF MAUI COUNTY

Table II-l summarizes economic and demographic information about the County of Maui, including the islands of Maui (four districts), Molokaʻi (two districts), Lanaʻi and Kahoʻolawe (one district each). For statistical purposes, Kalawao County (the former colony on Molokaʻi for quarantined Hansen's disease patients) is treated as a district of Maui County.

Many of the descriptive economic statistics for Maui County are available only at the aggregated County level; that is, they are not available for each individual island. Nonetheless, wherever possible, data for individual islands are used. Reflecting the data availability, the discussion below first presents information for Maui County, with an emphasis on describing quantitative indicators. Discussions of the individual islands that make up the County follow, with quantitative information provided as available. Estimates and figures presented in this section are taken from the State Data Book as well as the Maui County Data Book 2001, as are the estimates in Table II-1.

2.a. Maui County

2.a.(1) Population and Distribution

In the year 2000, the County of Maui had a population of 128,241residents, up 27.6 percent since the 1990 U.S. census. The total Maui County population amounted to 10.6 percent of the State population, the third largest of the four counties (after Oʻahu).

Based on year 2000 estimates, the island of Maui hosts the greatest population by far of the four County islands, supporting about 91.7 percent of Maui County residents. A much smaller fraction of the County's population lives on Molokaʻi (5.8 percent) and Lanaʻi (2.5 percent). Kahoʻolawe has no permanent residents.

2.a.(2) Primary Economic Activities

The economy of Maui County is dominated by a large visitor industry located mostly on the island of Maui. It also features a large but shrinking agriculture industry and a budding high-technology industry, also on the island of Maui.

Tourism

Tourism overwhelmingly dominates the economy of the County (personal communication with Maui Chamber of Commerce, April 2002). The County hosted over 2.3 million visitors in the year 2000, resulting in an average of 43,854 visitors present on the islands (the average visitor census).

From 1990 to 2000, the average visitor census increased 11 percent. While the annual number of visitors to Maui County actually declined 3.6 percent during that time, the visitor census nonetheless rose due to an increase in the average length of stay. Of the visitors present, approximately 95.4 percent were on the island of Maui, 2.1 percent on Moloka‘i, and 2.6 percent on Lana‘i. Also, approximately 86 percent were Americans and most of the remainder were Japanese and Canadians.

From 1990 to 2000, visitor expenditures increased significantly, by approximately 39.5 percent. This increase was greater than the 27.7-percent increase in inflation as measured by the Consumer Price Index (CPI).

Further detail on the visitor industry on each island is provided in the island-specific discussions, below.

Agriculture

Agriculture, while the second-largest industry in the County, is much smaller than tourism. Specifically, in 2000, agricultural sales in the County totaled approximately $118 million, or only four percent of visitor expenditures.

In addition, Maui County’s agriculture industry is becoming smaller in size. During the 1990s, agricultural sales declined 22.1 percent, due largely to contraction in plantation agriculture and increased competition from farmers on O‘ahu.

Agricultural activities include sugar and pineapple plantations on the island of Maui, and diversified crops and ranching located mostly on the islands of Maui and Moloka‘i. Further details on island-specific agriculture are discussed in the subsection for each island.

High-Technology Activities

As mentioned above, the island of Maui has a budding high-tech industry, although income figures for the industry have not been aggregated. Information on the specific activities is discussed in the subsection on Maui Island.

2.a.(3) Labor Force and Employment

In 2000, the County's civilian labor force numbered about 72,400 workers, up 28.1 percent since 1990. Employment reached 69,350 workers, up 28.9 percent since 1990 and resulting in a relatively low unemployment rate of 4.2 percent. The number of wage and salary jobs for Maui County increased 22.6 percent (versus 28.9 percent for all jobs), indicating a large increase in the number of self-employed workers and farmers.

As suggested by the discussion of primary economic activities above, most of the County's wage and salary jobs are concentrated in non-farming and non-manufacturing sectors. The primary employers are: (1) transportation, communications, and utilities; (2) trade (retail and wholesale); (3) services (hotel, tourism, and health); and (4) government. The number of wage and salary jobs rose in all these categories from 1990 to 2000. On the other hand, wage and salary jobs declined in the following sectors: (1) construction and mining; (2) manufacturing; (3) finance, insurance and real estate; and (4) agriculture (the declines would be less dramatic if self-employed workers and farmers were counted).

Employment estimates vary considerably from island to island within the County; more information is provided in the island-specific discussions below.

2.a.(4) Personal Income

Reflecting the growth in the tourism sector, the County's total personal income and per-capita income started out the decade in 1990 at $2 billion and $19,782, respectively, and finished the decade in 1999 at nearly $3 billion and $24,312, respectively. This represents a significant increase in overall income of 47.6 percent, and a more modest increase in per-capita income of 22.9 percent. While beneficial, this modest increase in per-capita income failed to keep pace with inflation as measured by the 25.5-percent increase in the CPI during the same 1990-to-1999 period. More information on personal income is provided in the island-specific discussions, below.

2.b. Island of Maui

2.b.(1) Population and Distribution

In the year 2000, the island of Maui had 117,644 residents. The population increased 28.2 percent since the 1990 U.S. census, a significantly greater increase than Moloka'i and marginally less than Lana'i. As noted above, the island hosts approximately 91.7 percent of the total County population. In 2000, Maui Island's population was geographically distributed as follows (presented in order of most- to least-populated):

— Wailuku District (Central Maui): 52.1 percent

Wailuku and Kahului, which abut one another at the northern end of the isthmus, serve as the commercial and industrial center of Maui Island. They also contain the County seat, the main airport, and Maui's main harbor. Most Wailuku District residents live in towns along the northern end of the isthmus and, to a lesser extent, along the southern end of the isthmus. The Wailuku District also hosts a large number of visitors, particularly in resorts along the south shore of the isthmus.

— Makawao District: 31 percent

Most Makawao District residents live in towns located "Upcountry" on the western slopes of Haleakala between the 1,000- and 4,000-foot elevations. To a lesser extent, they live in a few small towns near the shoreline at the northern and southern ends of the district. This district also hosts a large number of visitors, particularly in resorts along the south shore.

— Lahaina District (West Maui): 15.3 percent

Most residents of the Lahaina District live in towns located along the shoreline at the western end of the island. This district also hosts a large number of visitors in the West Maui resorts.

— Hana District: 1.6 percent

Most residents of the Hana District live in the town of Hana and in small communities scattered along the northern and eastern ends of Haleakala.

There are no large communities in the mountainous interior of West Maui, or along portions of the north and south shores of West Maui. Also, there are no large communities along the north, east and south flanks of Haleakala, or along the north and south shores of Haleakala. A variety of factors contribute to the lack of development in these areas, including steep slopes, difficult access, the need for watershed protection, local community preferences regarding development, and others.

2.b.(2) Primary Economic Activities

The island of Maui has a strong economy that is driven by a large and growing visitor industry, a large but shrinking agriculture industry, and a budding high-technology industry.

Tourism

Tourism is Maui Island's primary business (personal communication with Maui Chamber of Commerce, April 2002). Maui Island hosted over 2.2 million visitors in the year 2000, resulting in an average of 41,819 visitors present on the island. Reflecting trends at the County level, from 1990 to 2000 the annual number of visitors to Maui Island declined 4.2 percent, but the average visitor census increased 9.6 percent due to longer stays.

Most of the resorts are located at the western end of the island, along the south shore of Central Maui, and along the southwestern shore of Haleakala.

Maui Island's visitor industry is healthy, as exhibited by strong occupancy and room rates. Contributing factors include: (1) the robust economic growth in California and other western states; (2) a new generation of commercial aircraft that can depart from the short runway on Maui with sufficient fuel to fly to the U.S. mainland; and (3) a variety of natural and developed attractions. Like tourism across all the Hawaiian islands, Maui Island's tourism level declined following the terrorist attacks of September 11, 2001, but has since begun to recover.

Agriculture

The economic significance of agriculture on Maui Island is small compared to tourism (personal communication with Maui Chamber of Commerce, April 2002). This represents a significant contrast to most of the 1900s, however, when sugar and pineapple were the economic mainstays of Maui Island, with plantations located in Central Maui and West Maui. Currently, only two plantations remain: a large sugarcane plantation which is the dominant user of land in Central Maui, and a large pineapple plantation whose fields are split between Central Maui and West Maui. In 1999, a small sugarcane plantation in West Maui closed, thereby freeing land for other uses.

As plantation agriculture has declined, other types of agricultural activities have, to some extent, replaced it. Some of the fields in Central Maui and West Maui have been replanted in diversified crops (i.e., all crops other than sugarcane or pineapple). Also, some Upcountry Maui farmers take advantage of the cooler temperatures to grow specialized crops. Diversified crops on Maui Island include: macadamia nuts, coffee, papaya and other fruits, seed corn, flowers and nursery products, and vegetables. Finally, most of the agricultural land that is unsuitable for growing crops is used for grazing.

While the economic significance of agriculture on Maui is now small compared to tourism, it remains the island's dominant user of land and water.

High-Technology Activities

Maui has a growing high-technology industry that was forged largely on two separate complexes.[8] One is a grouping of five observatories near the summit of Haleakala. The observatories specialize in studies of the sun, galactic and quasar research, lunar and satellite ranging, and space surveillance.

The second high-technology complex is comprised of companies and operations at the Maui Research & Technology Park. The most prominent tenant is the Maui High Performance Computing Center, a national supercomputing center. Many of the companies in the Research & Technology Park take advantage of the Center's supercomputer, including some that support observatory operations.

2.b.(3) Outlook for Growth and Socioeconomic Change

The primary driving forces for Maui Island's economy will continue to be tourism and, to a much lesser extent, high-technology activities and diversified agriculture. However, limiting factors will be traffic congestion and possibly limited water in some parts of the island.

Most of the growth on Maui Island will continue to be on the west end of the island, on the southern shore of the isthmus, in the towns of Wailuku and Kahului, and in Upcountry Maui. Due to a variety of factors, including steep slopes, difficult access, the need for watershed protection, local community preferences regarding development, and others, little or no growth is anticipated in the following areas: (1) in the mountainous interior of West Maui; (2) along portions of the north and south shores of West Maui; (3) along the north, east and south flanks of Haleakala; and (4) along the north and south shores of Haleakala.

[8] Specific data on the size of this industry are not available.

2.c. Island of Molokaʻi

2.c.(1) Population and Distribution

In the year 2000, the island of Molokaʻi had 7,404 residents, approximately 5.8 percent of the County's total population. The island's population has grown 10.2 percent since the 1990 U.S. census, a significantly smaller growth rate than those for Lanaʻi and Maui Island for the same period.

In the most recent census, only two towns had populations greater than 1,000 residents: Kaunakakai on the south coast (2,726); and Kualapuʻu in central Molokaʻi on Hawaiian Homestead Lands near the airport (1,936). The third largest community and a former plantation town, Maunaloa Town in West Molokaʻi, had a population of 230. On the north side of the island, Kalaupapa had 147 residents. The remainder of Molokaʻi's population lives in scattered communities along the narrow coastal plain on the south side of East Molokaʻi, and in a small community near the now-closed Kaluakoi Hotel and Golf Club at the west end of the island.

There are no communities in the mountainous interior of East Molokaʻi or on its flanks; no communities on the mountain that forms West Molokaʻi or its flanks, with the exception of Maunaloa; no communities on the north shore other than Kalaupapa and a small community at the east end of the island; no communities along the west shore except for the former resort area; and no communities along the south shore of West Molokaʻi.

2.c.(2) Primary Economic Activities

Molokaʻi has a small rural economy that is based largely on tourism, agriculture, ranching, and limited aquaculture.

Tourism

Molokaʻi hosted 64,560 visitors in the year 2000, resulting in an average visitor census of 904 visitors. Attractions include excursions to Kalaupapa, golf and ecotourism. However, even with the robust economic growth in California and other western states during the 1990s, Molokaʻi's tourism industry has not expanded, primarily because it has not competed well with the other Hawaiian islands which have more attractions and offer direct mainland flights. Unlike Maui Island and Lanaʻi, both Molokaʻi's annual number of visitors and average visitor census declined, down 37.7 percent and 17.8 percent, respectively, from 1990 to 2000. The drop in visitor count was due largely to the fact that some hotels closed during the 1990s, resulting in a 23.3-percent decrease in the number of visitor units from 559 in 1990 to 429 in 2000. In addition, occupancy rates suffered for the remaining units; the average occupancy rate for the 429 visitor units on Molokaʻi was only 42.7 percent in the year 2000. Most recently, in January 2001, the island's largest hotel—the 138-room Kaluakoi Hotel and Golf Club—closed operations.

Despite the decline in number of visitors to Molokaʻi, tourism remains one of the primary industries in Molokaʻi. The Molokaʻi Visitors Bureau is currently working with the Maui Visitors Bureau to attract more visitors to the island (personal communication with Maui Chamber of Commerce, April 2002).

Agriculture, Ranching and Aquaculture

Agriculture is the other primary industry in Molokaʻi. Similar to Maui Island, agriculture remains a part of Molokaʻi's economy but has changed in its characteristics over time. For the greater part of a century, pineapple was the island's chief industry. Plantations were located in West Molokaʻi on the Hoʻolehua Plain and on the western end near Maunaloa. However, the plantations closed by the early 1980s. A portion of the former plantation fields and other suitable agricultural lands have been planted in other crops, including watermelons, seed corn and other seed crops, coffee, bananas, papaya, vegetables, flowers and nursery products, and grass grown for hay. Also, *taro* continues to be grown in Halawa Valley on the east end of the island. Finally, agricultural lands not planted in crops are used mostly for grazing cattle.

However, the future growth of agriculture on Molokaʻi has been adversely affected by new competition from Oʻahu, where the closure of sugar plantations in the mid-1990s resulted in the release of good farm land for diversified crops. Farmers on Oʻahu have a competitive advantage because they are close to the large Honolulu market and, for export, Honolulu Harbor and the Honolulu International Airport. Competing farmers on Molokaʻi must absorb shipping cost to Oʻahu to supply these markets. As a result, agriculture is not expected to grow significantly.

In addition to diversified crops, aquaculture is being pursued on the sunny south shore of West Molokaʻi and in a few of the old Hawaiian fishponds on the south shore of East Molokaʻi. Fish, shrimp and *limu* (seaweed) are harvested for local sale and for export to Oʻahu.

2.c.(3) Outlook for Growth and Socioeconomic Change

In 2000, the unemployment rate was 14 percent, the highest in the major islands of the State. This high unemployment rate reflects the growing labor force combined with contraction in the visitor industry and slow or negative growth in other economic sectors. A number of residents engage in subsistence activity, including farming, hunting and fishing.

However, Molokaʻi has been experiencing some improvement in its economy through the rural Empowerment Zone/Enterprise Communities (EZ/EC) program. This program is administered by USDA's Office of Community Development. The program promotes self-sustaining, long-term economic and community development in areas of poverty, unemployment and general distress. The program works by helping communities develop and implement comprehensive strategic plans which are supported by partnerships among private, public and non-profit entities.

Molokaʻi was selected as an Enterprise Community in 1999, and began receiving federal funding from USDA. Project leaders work to leverage these federal funds with a broad array of partners, including Federal, State and local government, non-profit organizations, area businesses, public schools, and the University of Hawaiʻi. Currently, the Molokaʻi Enterprise Community has attracted a total of 42 partners, with a leveraging ratio of 24:1 (i.e., since January 1999, $24 has been raised for every dollar from the EZ/EC grant). Partners may also provide technical support, project leadership and/or in-kind services.

With the implementation of its 10-year strategic plan, Molokaʻi seeks to achieve economic growth and community development through environmental protection, the promotion of diversified agriculture, encouragement of tourism, and the addition of new community facilities. Results from the Enterprise Community designation are already noticeable. Since its designation, the Molokaʻi EC has contributed to the rapid decline in unemployment rate by creating a total of 88 new full-time

jobs, with more than 80 percent of these jobs being sustainable positions (Molokaʻi Enterprise Community Annual Report, 2002).

In summary, although Molokaʻi is still experiencing slow economic and population growth, various efforts, including the EZ/EC program and cooperation between the Molokaʻi Visitors Bureau and the Maui Visitors Bureau, may help revitalize the island's economy in the future.

2.d. Island of Lanaʻi

2.d.(1) Population and Distribution

In the year 2000, Lanaʻi had an estimated population of 3,193 residents, up 31.6 percent since the 1990 U.S. census. Lanaʻi had the highest growth rate of all of the Maui County islands, which in part reflects its relatively smaller population. Nearly all residents live in the island's only residential community, Lanaʻi City, near the center of the island. However, two upscale residential communities are being developed near the island's two major resorts—one at Koele near Lanaʻi City and one at Manele Bay to the south.

2.d.(2) Primary Economic Activities

As explained below, an abrupt shift in the island's economic base occurred in the early 1990s. The opening of two luxury resorts, coupled with the closure of a large pineapple plantation, shifted the economy from one dominated by plantation agriculture to one dominated by tourism and resort-residential development.

Tourism

Lanaʻi's economy is dominated by tourism (personal communication with Maui Chamber of Commerce, April 2002). In the year 2000, Lanaʻi hosted 87,662 visitors, resulting in an average visitor census of 1,131, almost a third as large as the resident population.

From 1990 to 2000, the small tourism industry on Lanaʻi expanded significantly. The annual number of visitors to Lanaʻi increased by a startling 90.9 percent, and the average visitor census increased by a remarkable 352.3 percent. These increases were due almost entirely to two new resorts. In 1990 and 1991, Castle & Cooke opened the two world-class resorts—one at Koele (102 rooms) just northeast of Lanaʻi City, and the other a few miles away at Manele Bay (250 rooms) on the south shore. Taking into account an old eleven-room hotel and other visitor accommodations, there are a total of 368 visitors units on Lanaʻi (Visitor Plant Inventory, 2000). In addition, Castle & Cooke has the major entitlements for a second 150-room hotel at Manele Bay.

Visitor attractions include golf, ocean activities (diving, snorkeling, sailing, fishing, whale-watching, kayaking), horseback riding, hiking, mountain biking, exploring by four-wheel-drive vehicle, and hunting (axis deer, Mouflon sheep, and game birds).

Resort/Residential Community Development

A related industry involves development of luxury condominiums and custom homes as part of the resort development at Koele and Manele Bay. A total of 827 resort-residential single-family homes have been approved, of which eight were built by the end of 2001. A total of 332 multi-family units have been approved, and 61 were built by the end of 2001. At Koele, the condominium

prices range in price from $600,000 to $850,000, while house lots range from $325,000 to $525,000. At Manele Bay, the condominiums range from $995,000 to $2.2 million, and house lots range from $850,000 to $15 million.

Nearly all of the purchases are for retirement homes or second homes. Expenditures on goods and services by the permanent and temporary residents, including expenditures on upkeep of their homes, will contribute to Lana‘i’s economy in a fashion similar to tourism.

Agriculture

In contrast to tourism and home development, agriculture comprises a very small fraction of Lana‘i’s economy (personal communication with Maui Chamber of Commerce, April 2002). The minor role of agriculture in Lana‘i’s economy represents the end of a decline in that industry that began in the early 1990s. Specifically, from the early 1920s to the early 1990s, Dole Food Company, Inc. (Dole), which came under the control of Castle & Cooke in the early 1930s, owned 98 percent of the island and operated the largest single pineapple plantation in the world—16,000 acres. The pineapple was barged to O‘ahu where it was canned then shipped to the U.S. mainland and overseas markets. Pineapple was well-suited for the island because it requires little water which is limited on Lana‘i. By the 1980s, however, the market for pineapple grown for canning was faltering in Hawai‘i and, in 1993, Lana‘i’s Dole plantation was phased out.

Since the plantation closed, only about 100 acres remain in pineapple. It is sold to residents and the Lana‘i hotels. Other diversified crops include small volumes of hay, macadamia nuts, papayas, bananas, vegetables, and herbs. Some of these diversified crops are purchased by the two resorts, particularly the herbs. Livestock include penned cattle and pigs.

Outside the plateau where pineapple was grown, most of the land designated for agriculture is unsuitable for farming. This reflects the fact that Hawai‘i’s Agricultural District is a catch-all category that includes all land not otherwise categorized, regardless of the agricultural quality of the land.

2.d.(3) Outlook for Growth and Socioeconomic Change

Lana‘i has one of the lowest unemployment rates in the state: 3.5 percent in 2000. For the foreseeable future, economic and population growth on Lana‘i is likely to be driven by (1) an expansion of tourism in terms of higher occupancy rates and increased visitor expenditures, and a new 150-room hotel; and (2) development of resort-residential homes for wealthy retirees and owners of second homes. This will continue Lana‘i’s transition from the rural, plantation-based economy that dominated the 20th century to a more upscale service economy in the 21st century.

Over the next 10 years and beyond, no new hotels and no resort-residential development are anticipated beyond the current plans mentioned above. This assessment reflects current plans for the island as well as limits imposed by the available water supply.

2.e. Island of Kahoʻolawe

2.e.(1) Population

Kahoʻolawe has no permanent resident population. However, short-term workers and visitors may stay overnight on occasion. In fact, no communities have existed on Kahoʻolawe since before the 1940s.

2.e.(2) Activities on Kahoʻolawe

The U.S. military assumed control of Kahoʻolawe at the beginning of World War II (1941) and, for the next 49 years (through 1990), used the island for amphibious landing exercises; as a target for naval and aerial bombardment training; and for other training involving the live-firing of weapons. Before 1941, Kahoʻolawe was used for ranching.

In 1994, the island was conveyed to the State and placed under the control of Native Hawaiians via the Kahoʻolawe Island Reserve Commission (see Chapter IV). That same year Congress authorized $400 million for a 10-year program to clear the island of unexploded surface ordnance, and restore its cultural and natural resources. With funding from the U.S. Navy, a private contractor is clearing the island with the goal of making major portions of it safe for human access. The Navy estimates that 69 percent of the surface but less than 10 percent of the subsurface will be cleared by the end of the 10-year period.

Selected areas will be cleared for specific uses including revegetation with native species, trails and roads, cultural sites, camping areas, and educational facilities. An education and cultural center is planned, and a rock quarry is being developed that will be used to improve the existing eight-mile road from the shoreline base camp at Hanakanaea to the Lua Makika Crater.

While Kahoʻolawe has no permanent residents, about 50 workers live in barracks on the island, and another 325 workers are flown in from Maui Island four times a week for day visits to work in the ordnance-clearing effort. Also, the island is visited regularly by members of a Native Hawaiian organization that has a special arrangement with the Navy.

2.e.(3) Outlook for Growth and Socioeconomic Change

As indicated above, future land uses on Kahoʻolawe are likely to include preservation, education and cultural uses once the island is cleared of unexploded ordnance.

Table II-1. Socioeconomic Profile of the County of Maui
(including Kalawao)

Item	1990	1999	2000	Growth since '90
Resident Population, County	100,504	n/a	128,241	27.6%
Maui Island	91,361	n/a	117,644	28.8%
Lahaina District	14,574	n/a	17,967	23.3%
Wailuku District	45,685	n/a	61,346	34.3%
Makawao District	29,207	n/a	36,476	24.9%
Hana District	1,895	n/a	1,855	-2.1%
Moloka'i Island	6,717	n/a	7,404	10.2%
Molokai, excluding Kalawao	6,587	n/a	7,257	10.2%
Kalawao County	130	n/a	147	13.1%
Lana'i Island	2,426	n/a	3,193	31.6%
Kaho'olawe Island	n/a	n/a	n/a	n/a
Visitors				
Annual Visitors, County	2,389,970	n/a	2,304,666	-3.6%
Maui	2,345,060	n/a	2,246,253	-4.2%
Moloka'i	103,630	n/a	64,559	-37.7%
Lana'i	45,930	n/a	87,662	90.9%
Average Visitor Census, County	39,500	n/a	43,854	11.0%
By Island				
Maui	38,150	n/a	41,819	9.6%
Moloka'i	1,100	n/a	904	-17.8%
Lana'i	250	n/a	1,131	352.3%
By Origin				
U.S. Visitors	36,250	n/a	37,676	3.9%
Foreign Visitors	3,250	n/a	6,178	90.1%
Income from Major Industries				
($ million)				
Visitor Expenditures, County	$ 2,097.2	n/a	$ 2,925.6	39.5%
Agricultural Sales, County	$ 151.5	n/a	$ 118.0	-22.1%
Labor				
Maui County				
Civilian Labor Force	56,500	n/a	72,400	28.1%
Employed	53,800	n/a	69,350	28.9%
Unemployed	2,700	n/a	3,050	n/a
Unemployment Rate	4.8%	n/a	4.2%	n/a

Table II-1. Socioeconomic Profile of the County of Maui (Including Kalawao)
(continued)

Item	1990	1999	2000	Growth since '90
Labor (continued)				
Maui Island				
Civilian Labor Force	52,400	n/a	67,550	28.9%
Employed	50,300	n/a	65,000	29.2%
Unemployed	2,100	n/a	2,550	n/a
Unemployment Rate	4.1%	n/a	3.8%	n/a
Lana'i				
Civilian Labor Force	1,400	n/a	1,800	28.6%
Employed	1,300	n/a	1,700	30.8%
Unemployed	100	n/a	50	n/a
Unemployment Rate	5.9%	n/a	3.5%	n/a
Moloka'i				
Civilian Labor Force	2,700	n/a	3,100	14.8%
Employed	2,200	n/a	2,650	20.5%
Unemployed	500	n/a	450	n/a
Unemployment Rate	18.1%	n/a	14.0%	n/a
County Jobs, Wage and Salary Only[1]	50,900	n/a	62,400	22.6%
Construction, mining	3,150	n/a	2,650	-15.9%
Manufacturing	1,950	n/a	1,750	-10.3%
Trans., communication, utilities	3,000	n/a	4,500	50.0%
Trade	13,650	n/a	16,700	22.3%
Finance, insurance, real estate	3,350	n/a	3,000	-10.4%
Services and miscellaneous	17,350	n/a	24,000	38.3%
Government	5,850	n/a	7,850	34.2%
Agriculture	2,600	n/a	1,950	-25.0%
Personal Income, County				
Total ($ million)	$ 2,010	$ 2,966	n/a	47.6%
Per capita	$ 19,782	######	n/a	22.9%
Consumer Price Index—All	138.10	n/a	176.30	27.7%

1. 2000 job counts are preliminary.

Source: Department of Business, Economic Development & Tourism. The State Data Book. Annual.
Hawai'i Agricultural Statistics Service. *Statistics of Hawaii Agriculture* . Annual.

Note: Entries may not sum to totals due to rounding, slight acreage discrepancies, and overlapping land-management areas.

THE ENDANGERED SPECIES ACT[9] **CHAPTER III**

This chapter provides relevant information from the 1973 Endangered Species Act (the Act), including the role of critical habitat designation in protecting threatened and endangered species, requirements for consulting with the Service to insure that certain Federal actions do not endanger listed species or their habitats, and prohibited activities that apply to listed species.

1. ROLE OF SPECIES LISTING AND CRITICAL HABITAT DESIGNATION IN PROTECTING THREATENED AND ENDANGERED SPECIES

For species listed as threatened and endangered, the Act requires the Service to designate critical habitat to the maximum extent prudent and determinable. The Act defines critical habitat as the specific areas containing features essential to the conservation of a threatened or endangered species and that may require special management considerations or protection.

For listed species, section 7(a)(2) of the Act requires Federal agencies to consult with the Service in order to ensure that activities they fund, authorize, permit, or carry out are not likely to *jeopardize* the continued existence of the species. *Jeopardy* is defined as any action that would appreciably reduce the likelihood of both the survival and recovery of the species (see 50 C.F.R §402.02).

For the critical habitat of listed species, section 7(a)(2) further requires Federal agencies to consult with the Service to ensure that activities they fund, authorize, permit, or carry out do not result in destruction or *adverse modification* of critical habitat. *Adverse modification* of critical habitat is defined as any direct or indirect alteration that appreciably diminishes the value of critical habitat for the survival and recovery of the species.

As stated in the proposed rule, "... critical habitat also provides non-regulatory benefits to the species by informing the public and private sectors of areas that are important for species recovery and where conservation actions would be most effective." "Critical habitat also identifies areas that may require special management considerations … and may help provide protection to areas where significant threats to the species have been identified or help to avoid accidental damage to such areas."

[9]**Note to Reader:** Readers who are already familiar with the Act may wish to skip this chapter and proceed to the next background-information chapters (Chapters IV and V), or to the economic analysis (Chapter VI).

2. CONSULTATION UNDER SECTION 7 OF THE ACT

In accordance with section 7 of the Act, the implementing regulations require Federal agencies to consult with the Service whenever activities they fund, authorize, or carry out may affect listed species or designated critical habitat. Section 7 consultation with the Service is designed to ensure that current or future Federal actions do not appreciably diminish the value of critical habitat for the survival and recovery of a listed species.

The Service has authority under section 7 to consult on activities on land owned by individuals, organizations, states, or local and tribal governments only if the activities on the land have a *Federal nexus*. A *Federal nexus* occurs when the activities require a Federal permit, license, or other authorization, or involve Federal funding. The Service does not have jurisdiction under section 7 to consult on activities occurring on non-Federal lands when the activities are not federally funded, authorized, or carried out. In addition, consultation is not required for activities that do not affect listed species or their critical habitat.

When consultations concern activities on Federal lands, the relevant Federal Action agency initiates consultation with the Service. When an activity proposed by a state or local government or private entity requires a Federal permit or is federally funded or carried out, the Federal agency with the *nexus* to the activity initiates consultation with the Service. For example, the Army Corps of Engineers is the agency that issues section 404 permits under the Clean Water Act, so it is the Action agency that initiates consultation when an activity that requires a permit may affect a listed species or designated critical habitat.

The consultation begins after the Federal Action agency determines that its action may affect one or more listed species or their designated critical habitat, even if the effects are expected to be beneficial since projects with overall beneficial effects could include some adverse impacts. Consultations are frequently conducted for multiple species if more than one species is affected by the action.

The consultation between the Federal Action agency and the Service may involve informal consultation, formal consultation in the case of adverse impacts, or both. Informal consultation may be initiated via a telephone call or letter from the Action agency, or a meeting between the Action agency and the Service. In preparing for an informal consultation, the Action agency compiles all the biological, technical, and legal information necessary to analyze the scope of the activity and discusses strategies to eliminate adverse effects on listed species or critical habitat. Through informal discussions, the Service assists the Action agency and the Applicant, if any, in identifying and resolving potential conflicts at an early stage in the planning process, and may make recommendations, if appropriate, on ways to avoid adverse effects.

If during informal consultation the Federal Action agency determines that its action (as originally proposed or revised and taking into account direct and indirect effects) "is not likely to adversely affect" listed species or critical habitat (e.g., the effects are beneficial, insignificant or discountable), and the Service agrees with that determination, then the Service provides concurrence in writing and no further consultation is required.

But if the proposed action, as revised during informal consultation, is still likely to adversely affect listed species or critical habitat, the Action agency must request in writing initiation of formal consultation with the Service and submit a complete initiation package. Formal consultations, which are subject to specific timeframes, are conducted to determine whether a proposed action is likely

to *jeopardize* the continued existence of a listed species or destroy or *adversely modify* designated critical habitat. This determination depends on the extent to which a project may affect the species. Many variables, including the project's size, location and duration, may influence the extent of the impact and, in turn, the determination of a "may affect" opinion.

If the Service finds, in its biological opinion, that a proposed action is not likely to *jeopardize* the continued existence of a listed species, or destroy or *adversely modify* the critical habitat—even though the action may adversely affect listed species or critical habitat—then the action likely can be carried out without violating section 7(a)(2) of the Act.

On the other hand, if the Service finds that a proposed action is likely to *jeopardize* the continued existence of a listed species and/or destroy or *adversely modify* the critical habitat, then the Service provides the Action agency with reasonable and prudent alternatives that will keep the action below the thresholds of *jeopardy* and/or *adverse modification*, if any can be identified.

The Service works with Action agencies and Applicants in developing reasonable and prudent alternatives. A reasonable and prudent alternative is one that (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the Action agency's legal authority and jurisdiction; and (3) is economically and technologically feasible. The Service will, in most cases, defer to the Action agency's expertise and judgment as to the feasibility of an alternative. Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of a project. Costs associated with implementing reasonable and prudent alternatives vary accordingly.

3. TAKING AND OTHER RESTRICTIONS OF THE ACT

3.a. Wildlife Species

Regardless of any *Federal involvement* and/or critical habitat designation, once a species has been formally listed as threatened or endangered, it is entitled to certain regulatory protections under the Act. First and foremost, section 9 of the Act specifically prohibits the *taking* of any endangered species of fish or wildlife (the prohibition does not extend to plants). The term *take* is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." The regulations at 50 CFR section 17.3 define "harm" to mean an act that actually kills or injures wildlife. This may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. In addition, endangered species, their parts or any products made from them may not be imported, exported, possessed or sold. Section 4(d) of the Act gives the Service regulatory discretion to extend the protections of section 9 to threatened species. While clearly prohibiting direct injury to individuals of a listed species, the restrictions on *takings* also apply to actions that destroy or alter the habitat of a listed species if the habitat alteration would result in harm to the species.

However, the Act allows the Service to permit *take* by private applicants that would otherwise be prohibited, provided such *taking* is "incidental to, and not [for] the purpose of, the carrying out of an otherwise lawful activity." Section 10(a)(1)(B) of the Act allows non-Federal parties planning activities that have no *Federal nexus*, but which could result in the incidental *taking* of listed animals, to apply for an incidental *take* permit. The application must include a habitat conservation plan laying out the proposed actions, determining the effects of those actions on

affected fish and wildlife species and their habitats (often including proposed or candidate species), and defining measures to minimize and mitigate adverse effects. The Service may elect to issue an incidental *take* permit if the incidental *take* is to be minimized by reasonable and prudent measures and implementing terms and conditions that are stipulated in the permit.

3.b. Plant Species

Section 9(a)(2) of the Act states that it is unlawful to remove and possess any endangered plant species from areas under Federal jurisdiction; maliciously damage or destroy any such species on any such area; or remove, cut, dig up, damage, or destroy any such species on any other area in knowing violation of any state law. All of the threatened and endangered plants for which critical habitat designation is proposed on Maui and Kaho‘olawe are protected by Hawai‘i’s state endangered species law (HRS Chapter 195D). In addition, endangered species, their parts or any products made from them may not be delivered, received, transported, shipped or sold in interstate or foreign commerce. As above, section 4(d) of the Act gives the Service regulatory discretion to extend the protections of section 9(a)(2) to threatened plant species.

However, the Service may give permission to remove a listed plant from areas under Federal jurisdiction, and may also give permission for actions that are otherwise prohibited by section 9 of the Act for “scientific purposes or to enhance the propagation or survival of the affected species including, but not limited to, acts necessary for the establishment and maintenance of experimental populations.”

EXISTING PROTECTIONS IN MAUI COUNTY[10] CHAPTER IV

In addition to the Act, other existing regulations and land-management programs protect Hawai‘i’s threatened and endangered species and their habitats. This chapter provides an overview of these protections, including: other Federal programs, State protections for listed species, State land-use controls affecting public and private lands, county land-use controls, and land management by various public and private organizations. Those protections in place on proposed critical habitat are summarized in Table I-1. As appropriate, the information in this chapter and in Table I-1 is used in Chapter VI to estimate the section 7 economic impacts that occur over and above impacts attributable to existing protections.

1. FEDERAL SPECIES PROTECTIONS AND LAND MANAGEMENT

1.a. Integrated Natural Resources Management Plans

The Sikes Act Improvements Act (SAIA) of 1997 requires every military installation containing land and water suitable for the conservation and management of natural resources to complete, by November 17, 2001, an Integrated Natural Resources Management Plan (INRMP). The purpose of the INRMP is to integrate the mission of the military installation with stewardship of the natural resources found there. Each military installation that has listed species or critical habitat on areas it manages consults with the Service on its INRMP.

1.b. Conservation Partnerships Program, Pacific Islands Ecoregion

The Service’s Conservation Partnerships Program is a collection of voluntary habitat restoration programs having the goal of restoring native Pacific Island ecosystems through collaborative projects with private landowners, community groups, conservation organizations, and other government agencies. The Program can provide cost-share funds, as well as information on habitat restoration techniques, native species, Safe Harbor Agreements, additional funding sources, required permits, and potential vendors of restoration services (fence contractors, nurseries, etc.) The Program is divided into five sections, discussed below.

[10]**Note to Reader:** Readers already familiar with existing protections in Hawai'i of threatened and endangered species and their habitats may wish to skip this chapter and proceed to the approach to the analysis (Chapter V), or to the economic analysis (Chapter VI).

1.b.(1) Partners for Fish and Wildlife Program

The Partners for Fish and Wildlife (PFW) Program is the Service's habitat restoration program for long-term conservation on private land. The PFW Program was established to offer technical and financial assistance to landowners who wish to restore wildlife habitat on their property. PFW Programs can include constructing fences to exclude feral ungulates; controlling the population of feral ungulates, weeds, rodents, and alien insects; restoring native ecosystem elements such as hydrology and micro-habitat conditions; and reintroducing native species.

The Service provides assistance ranging from informal advice on the location and design of potential restoration projects to cost-shared funding under a formal cooperative agreement with the landowner. If warranted, the Service also provides participating landowners with technical assistance to develop Safe Harbor Agreements that cover habitat managed for endangered or threatened species. The Agreements provide assurances to landowners that additional land, water, and/or restrictions on uses of natural resources will not be imposed as a result of their voluntary conservation actions.

Since funding is limited, the projects given the highest priority are those that manage or reestablish natural biological communities and provide long-term benefits to declining migratory bird and fish species and species that are endangered, threatened, or proposed for listing; and projects on private lands that provide expanded habitat for wildlife populations that inhabit National Wildlife Refuges.

1.b.(2) The Hawai‘i Biodiversity Joint Venture

The Hawai‘i Biodiversity Joint Venture (HBJV) is a public-private effort to protect, maintain, improve, and restore the native biological diversity of the Hawaiian Islands. In this program, the Service's mission is to work with others to conserve, protect, and enhance fish, wildlife, and plant populations and their habitats.

The HBJV was initiated with the following goals:

— Maintain natural communities and habitats for native species;

— Support efforts to cooperatively manage significant native ecosystems on public and private land;

— Develop natural resource management techniques to address widespread threats (such as feral ungulates, weeds, rats, and alien insects) to Hawai‘i's native ecosystems;

— Restore former wetlands, native forests and other natural communities on public and private lands; and

— Protect native Hawaiian ecosystems and natural communities through land and water acquisition and management.

Since funding is limited, the Service gives priority to projects that implement management or research actions that directly contribute to protecting or restoring habitats for multiple endangered, threatened, candidate, or rare species; address key threats to native ecosystems or habitats; and benefit rare or unique ecosystems or habitats.

1.b.(3) Pacific Islands Coastal Program

The Pacific Islands Coastal Program identifies and conserves important coastal natural resources. The goals of the program are to:

— Identify and prioritize coastal natural resources and threats;

— Implement on-the-ground projects in partnership with others; and

— Promote public stewardship of coastal fish, wildlife, plants and their habitats.

The objectives of the program include:

— Protecting and restoring coastal wetlands and uplands, anchialine pools, estuaries, coral reefs and streams;

— Preventing and eradicating invasive alien species in coastal areas;

— Protecting and restoring watersheds for native species' habitat needs;

— Building public support through partnerships, education and community involvement; and

— Inventorying and mapping coastal resources.

1.b.(4) Endangered Species Landowner Incentive Program

The Endangered Species Landowner Incentive Program is a focused effort to combine cost-share funds and regulatory relief incentives (Safe Harbor Agreements and Candidate Conservation Agreements) to address high-priority habitat restoration needs of endangered, threatened and candidate species.

1.b.(5) Other Habitat Restoration Programs

Other Habitat Restoration Programs include the National Coastal Wetlands Conservation Grant Program and the North American Wetlands Conservation Grant Program. In addition, the Conservation Partnerships Program seeks to provide a connection between habitat restoration projects and non-Service funding sources.

1.c. Wildlife Habitat Incentives Program

Under the Wildlife Habitat Incentives Program (WHIP), the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA) provides assistance to landowners and lessees (leases must be five years or more) to protect and restore Hawai'i's native habitats as

well as habitats of threatened and endangered species. In Hawai‘i, the focus is on the following habitats:

— Threatened/endangered plant species habitat;

— Native forests/riparian areas adjacent or connected to a native forest reserve, wildlife refuge, or other preserved forest/riparian area;

— Montane wetlands and bogs;

— Coastal dunes that support rare plants, seabirds, monk seals or turtles;

— Anchialine pools;

— Endangered waterbird and migratory bird habitat; and

— Caves and rare species habitat.

The NRCS works with private landowners and lessees to help them develop a Wildlife Habitat Development Plan for their land that benefits native wildlife and meets other goals and objectives of WHIP. If the Plan is selected for funding, a five- to 10-year contract is entered into whereby the landowner or lessee agrees to undertake wildlife habitat development practices such as noxious weed control, fencing, planting of native trees, and wetland restoration. In turn, NRCS reimburses the landowner or lessee 75 percent of the cost of carrying out these practices at specified rates. However, the funds cannot be used for mitigation of any kind, or on any land designated as converted wetland.

1.d. Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) is a voluntary USDA conservation program for farmers and ranchers who wish to address serious threats to soil, water, and related natural resources on their property. Administered through NRCS, EQIP provides technical, financial and education assistance for designated priority areas or significant statewide resource concerns.

Eligible land includes cropland, rangeland, pasture, forestland, and other farm or ranch lands. To evaluate proposed EQIP projects, NRCS first assesses the environmental benefits to be achieved from the planned implementation of conservation practices. Subsequently, applications are then ranked based on the amount of financial assistance requested and the projected environmental benefits.

EQIP offers five- to 10-year contracts for the implementation of conservation practices in each site-specific conservation plan. Each conservation plan, developed with assistance from NRCS or other service provider, must treat the targeted resource concern to a sustainable level. NRCS may pay up to 75 percent of the costs for eligible conservation practices which improve or maintain the health of the natural resources in the area.

Within Maui County, the east end of Moloka‘i has been designated as an EQIP priority area to address resource concerns about erosion, sedimentation, pest infestation and insufficient water supply.

1.e. Conservation Reserve Program

The Conservation Reserve Program (CRP) is a voluntary program administered through the Farm Service Agency, with technical assistance provided by the NRCS. By offering annual rental and cost-share assistance, NRCS encourages farmers and ranchers to plant long-term vegetative cover to improve soil, water, and wildlife resources.

To be eligible for CRP, land must have been planted in an agricultural commodity two out of the last five years. Some marginal pastureland may also quality for CRP if suitable for planting. In addition, the land must be considered highly erodible or subject to scour erosion. Finally, the land must be devoted to any of a number of highly beneficial environmental practices, such as filter strips, riparian buffers, grass waterways, shelter belts, wellhead protection areas, and other similar practices.

Annual rental payments are made based on the agricultural rental value of the land. Cost-share assistance will cover up to 50 percent of the cost of establishing the grass or trees on the land. CRP contracts last from 10 to 15 years, depending on the goals of the operator.

1.f. National Parks

The National Park System, operated by the National Parks Service, was established to preserve natural areas in the United States so that they can be enjoyed by current generations and preserved for future generations. Within Maui County, Maui and Molokaʻi each has a national park.

— Haleakala National Park (Maui): this park covers 28,655 acres (44.8 square miles), including the summit of Haleakala, Haleakala Crater, Kipahulu Valley (a biological reserve closed to the public), and Oheʻo Gulch, which extends down to the sea. Mostly wilderness, the Park is home to 11 threatened and endangered plant species and the endangered Sphinx moth. A 1999 Haleakala National Park draft *Resources Management Plan* provides for permanent protection and management of the lands within the Park, and details the management issues and strategies used by the Park to protect, restore and enhance the rare and native plants and their habitat. These strategies include control of or research on non-native ungulates, rodents, invertebrates and weeds; fire control; and habitat restoration.

— Kalaupapa National Historical Park (Molokaʻi): this park contains the historic Hansen's disease isolation settlement of Kalaupapa, which consists of 1) a residential area on the leeward (western) side of the Kalaupapa Peninsula that is still home to many Hansen's disease residents; 2) two historic churches in Kalawao on the windward (eastern) side; and 3) a small airport and a lighthouse built in 1909 on the northern tip of the Peninsula. The Park and the lighthouse are listed separately on the National Register of Historic Places as national historic landmarks. A section of the Park is also within the North Shore Cliffs National Natural Landmark.

1.g. National Wildlife Refuges

Over 500 National Wildlife Refuges across the United States form a system of habitats managed by the Service. Hawai'i's Refuges were established to protect the Islands' unique native plants and animals and their habitats. Within Maui County, Maui and Moloka'i each contains a Refuge.

— Kealia Pond National Wildlife Refuge (Maui): Kealia Pond, which covers 50 to 400 acres depending upon the season, lies adjacent to Ma'alaea Bay along the south central coast of Maui near the town of Kihei. The main body of the pond is separated from the Pacific Ocean by a narrow band of coastal sand dunes and a major road. The refuge protects the Hawaiian stilt, Hawaiian coot, black-crowned night heron, Hawaiian duck, migratory waterfowl, seabirds and introduced species.

— Kakahaia National Wildlife Refuge (Moloka'i): five miles east of the main town of Kaunakakai, this refuge protects the endangered Hawaiian coot and Hawaiian stilt, as well as 10 other species of bird. This 44-acre refuge contains a 15-acre freshwater pond, a seven-acre manmade impoundment built to provide additional shallow water habitat, and a marsh with dense thickets of bulrush.

2. STATE LAND MANAGEMENT

2.a. State Districting

All lands in Hawai'i are allocated by the State into one of four districts: Conservation, Agricultural, Urban or Rural. The State, through its Department of Land and Natural Resources (DLNR) and its Board of Land and Natural Resources (the Board), has primary land-management responsibility for activities and development in the Conservation District, while the counties have primary responsibility in the Urban, Rural and Agricultural Districts.

2.b. The Conservation District

The purpose of the Conservation District is to conserve, protect and preserve the State's important natural resources through appropriate management in order to promote the long-term sustainability of these natural resources, and to promote public health, safety and welfare (Hawai'i Revised Statutes, Chapter 183C). To this end, only limited development and commercial activity are allowed in the Conservation District. "Important natural resources" include the watersheds that supply potable water and water for agriculture; natural ecosystems and sanctuaries of native flora and fauna, particularly those which are endangered; forest areas; scenic areas; significant historical, cultural, archaeological, geological, mineral and volcanological features and sites; and other designated unique areas.

Permission is required to use land, construct facilities, or conduct other activities in the Conservation District (see below). Permits for routine uses or activities are issued by DLNR, while more complex activities or uses (such as certain construction projects and commercial operations) require formal approval of a Conservation District Use Application (CDUA) by the Board, and often require an approved management plan.

2.c. Conservation District Subzones

All land in the Conservation District has been assigned to one of five subzones that reflect a hierarchy of uses from the most restrictive to the most permissive. These subzones are the Protective Subzone (the most restrictive), Limited, Resource, General and Special (Hawai'i Administrative Rules, Title 13, Chapter 5). Except for the Special Subzone, all uses and activities allowed in a more restrictive subzone in the hierarchy are allowed in the less restrictive subzones.

2.c.(1) Protective Subzone

The Protective Subzone, the most restrictive of the five subzones, was established to "… protect valuable resources in designated areas such as restricted watersheds, plant and wildlife sanctuaries, and other designated natural and unique areas." Correspondingly, lands and waters generally included in this subzone are needed to protect watersheds, water sources, and water supplies; and to preserve the natural ecosystems of native plants and wildlife, particularly endangered species.

No structures, homes, or farm activities are allowed in the Protective Subzone, with two exceptions. First, the land can be used by State and county governments and by non-government entities that serve the public (e.g., the local utility companies) "for public purpose"—i.e., to fulfill mandated government functions for the public benefit such as transportation systems, water systems, and communications systems or recreational facilities. Second, Native Hawaiians owning *kuleana* land (land that was granted to Native-Hawaiian tenants in the mid-1800s) may use it for agriculture or single-family residences if their land was used "historically and customarily" for these purposes.

Allowed uses (by permit or Board approval) in the Protective Subzone include: replacing or reconstructing an existing structure and some types of accessory structures, habitat improvements for plant and wildlife sanctuaries, Natural Area Reserves, wilderness areas and scenic areas, limited removal of certain trees, and removal of noxious plants from small areas provided that the ground is not disturbed significantly. Limited landscaping is allowed, but is restricted to plants that are endemic or indigenous; alien subspecies are specifically prohibited.

2.c.(2) Limited Subzone

The Limited Subzone encompasses areas that are potentially dangerous to the public due to possible flooding, soil erosion, *tsunami* (tidal waves), volcanic activity or landslides. Lands having a general slope of 40 percent or more are also included in this subzone. The purpose of the Limited Subzone is to limit uses where natural conditions suggest that human activity should be constrained.

In addition to what is permitted in the Protective Subzone, the following activities and uses are allowed in the Limited Subzone by permit or Board approval: accessory structures near existing structures; single-family homes (one per lot) if State and county regulations are followed; agricultural activities; facilities or devices used to control erosion, floods and other hazards; botanical gardens and private parks; landscaping; and removal of noxious plants in areas larger than 10,000 square feet that result in significant ground disturbance.

2.c.(3) Resource Subzone

The Resource Subzone encompasses lands that are suitable for growing and harvesting commercial timber or other forest products, park land, and land for outdoor recreation (hunting,

fishing, hiking, camping and picnicking, etc.). The purpose of the Resource Subzone is to develop properly managed areas to ensure the sustainable use of Hawai‘i’s natural resources.

In addition to what is permitted in the Protective and Limited Subzones, the following activities and uses are allowed in the Resource Subzone by permit or Board approval: commercial forestry under an approved management plan, and mining and extraction of any material or natural resource.

2.c.(4) General Subzone

The General Subzone is used to designate open space where special conservation uses may not yet be defined, but where urban uses may be premature. This subzone encompasses lands that may not be adaptable to or needed currently for urban, rural or agricultural use. The General Subzone also includes lands that are suitable for farming, flower gardening, nursery operations, orchards and grazing. Golf courses are not allowed.

In addition to what is permitted in the Protective, Limited and Resource Subzones, facilities necessary for the above-mentioned uses are allowed by permit when these facilities are compatible with the natural physical environment, and the use promotes natural open space and scenic value.

2.c.(5) Special Subzone

Special Subzones are designated for educational, recreational and research purposes. These subzones set aside lands possessing unique developmental qualities that complement the natural resources of an area.

2.d. Additional Management in the Conservation District

In addition to the five subzones in the Conservation District, the State has established further controls by defining other areas it manages within the Conservation District. These include Forest Reserves, the Natural Area Reserve system, State Hunting Units, State parks and State trails. These are discussed below.

2.d.(1) Forest Reserves

State Forest Reserves were first established in Hawai‘i over a century ago to protect the supply of high-quality water that was being threatened due to the destruction of Hawai‘i’s rainforests. The stated purpose of a Forest Reserve is to protect native ecosystems and important watersheds (Hawai‘i Revised Statutes, Sections 183-2 and 183-17). Most of Hawai‘i’s Forest Reserves are in the Resource Subzone. Limited collecting for personal use (e.g., *ti* leaves and bamboo) is allowed by permit, as is limited (no more than $3,000 value per year) commercial harvesting of timber, seedlings, greenery and tree ferns. Commercial forestry operations are allowed only with approval from the Board. Permission is required to reside in a Forest Reserve, hunt (see below), camp and fish. Land vehicles, mountain bikes, horses, mules and leashed dogs are allowed on designated roads and trails.

Collecting endangered or threatened plants or wildlife is not allowed and, except in the situations described above or with Board approval, no forms of plant or animal life may be removed, injured or killed.

Within Maui County, State Forest Reserves are found on Maui and Moloka‘i. Maui is home to the West Maui, Ko‘olau, Hana, Kipahulu, Kahikinui, Kula, and Makawao Forest Reserves; and Moloka‘i is home to the Moloka‘i Forest Reserve.

2.d.(2) Natural Area Reserves

A Natural Area Reserve (NAR) is based on the concept of protecting ecosystems rather than individual species, with the goal of preserving and protecting representative samples of Hawaiian biological ecosystems and geological formations (Hawai‘i Revised Statutes, Sect. 195-5). Although most NARs are located in the State Conservation District, they can include land in other Districts.

Management activities in a NAR include restoring and enhancing existing populations of native plants, removing non-native weeds, and working with local hunters to keep non-native animal populations low in sensitive areas.

Permitted activities in NARs include hiking, nature study and bedroll camping. Game hunting and research or educational activities are allowed by permit. Prohibited activities in NARs include: improvements or construction; tent camping; vehicles, except on designated roads; and removing, injuring, killing or introducing plants or wildlife.

Within Maui County, NARs are found on Maui and Moloka‘i. Maui is home to the following NARs:

— ‘Ahihi-Kina‘u (2,045 acres): this reserve is the first reserve created under the Natural Area Reserve System. Sparsely vegetated, the reserve is unique in that it contains an example of the most recent lava flow on the dry south flank of East Maui. The reserve also contains a marine area with high and low salinity anchialine pools that house a diversity of rare Hawaiian shrimps and native Hawaiian cave animals in coastal lava tubes. Coastal dry shrublands, coastal mesic boulder beach communities, and examples of pioneer vegetation can also be found within this NAR serving as habitats for other rare native plants and animals.

— West Maui (6,702 acres): this reserve encompasses lowland and montane native communities ranging from dry grasslands to wet ohi‘a forests. The reserve also includes bogs, montane lakes, forest bird habitat, and rare and endangered plants. The areas are extremely important watershed sites which contain the headwaters of perennial streams.

— Hanawi (7,500 acres): this reserve is located on the wet slopes of the north flank of Haleakala. It contains a rare subalpine grassland as well as montane and lowland semi-wet and wet grasslands and forests. Rare plants and endangered birds are also protected in this reserve.

— Kanaio (876 acres): this reserve is located in rough lava terrain on the southeast slope of Haleakala. The reserve protects a remnant of the native dryland forest that once covered the leeward slope of Haleakala. Kanaio provides visitors with a rich assemblage of native dryland trees and shrubs.

Molokaʻi is home to the following NARs:

— Puʻu Aliʻi (1,330 acres): located in the mountains of northern Molokaʻi, this reserve is a wet summit plateau inhabited by wet forests, mixed fern and shrub montane cliff communities, wet shrublands, and Hawaiian intermittent stream communities. The reserve also contains forest bird habitat and is an important part of the Molokaʻi watershed.

— Olokuʻi (1,520 acres): one of the few areas left undisturbed by feral ungulates, this reserve encompasses an isolated, cloud-shrouded mountain plateau with slopes extending down to sea cliffs. The reserve contains both wet and dry ecosystems, coastal dry grasslands, lowland and montane wet and mesic forests. Rare snails were also observed during a 1989 survey of this area.

2.d.(3) Wildlife Sanctuaries

Wildlife sanctuaries are established by the State to conserve, manage and protect indigenous wildlife (Hawaiʻi Revised Statutes, Sections 13-125). Within these sanctuaries, the following activities are prohibited: (1) to remove, disturb, kill, or possess any form of plant or wildlife; and (2) to introduce any form of plant or animal life. Also, human activity is strictly limited: no firearms or hunting equipment are allowed in nearly all sanctuaries; no camping, no fires, and no vehicles are allowed except on designated roads; and, in many cases, no entry is allowed except by permit for scientific, educational, or conservation purposes.

Several bird, plant, and other wildlife sanctuaries exist in Maui County. Wildlife sanctuaries in Maui include Pauwalu Point Wildlife Sanctuary located on the north shore of East Maui; the Manawainui Plant Sanctuary in West Maui; and several seabird sanctuaries along the island's coast. Molokaʻi's wildlife sanctuaries include Mokapu Bird Sanctuary located on an islet off the north shore; the Kamiloloa Plant Sanctuary in East Molokaʻi; and a few seabird sanctuaries along the coast of East Molokaʻi. Finally, Lanaʻi also maintains several seabird sanctuaries located mostly along the south coast.

2.d.(4) Hunting Units

A total of 47 hunting units, administered by DLNR, have been established across the State to control game hunting (Hawaiʻi Administrative Rules, Title 13, Chapters 122 and 123). Maui has seven such hunting units totaling 105,318 acres for hunting feral pigs and goats, pheasant (two species), Francolin (two species), chukar partridge, quail (two species), dove (two species), and wild turkey. Molokaʻi also has seven hunting units totaling about 16,000 acres; these units feature feral pigs, goats, and axis deer; ringneck pheasant; chukar partridge; Francolin (two species); quail (two species); dove (two species); and wild turkey. Finally, Lanaʻi has two hunting units, encompassing the western third of the island and totaling about 30,000 acres. These two hunting units are available for hunting axis deer, mouflon sheep, ring-necked pheasant, chukar partridge, Francolin (two species), quail (three species), dove (two species), and wild turkey. An additional 30,000 acres are privately managed for hunting in Lanaʻi.

Within the State Hunting Units, hunting is a licensed activity and is restricted. Restrictions vary among the islands and address: bag limits, hunting seasons, days allowed, hours of the day, and hunting method (rifle, muzzleloader, shotgun, handgun, bow and arrows, spear, dogs and

knives). DLNR's intent is to manage the hunting areas, game-mammal populations, and the level of hunting activity to achieve a reasonable balance between (1) recreational benefits for hunters and (2) protection to native ecosystems and threatened and endangered plants. Game hunting restrictions on private land are set by the landowner.

2.d.(5) State Parks

The State Parks System was established to govern the use and protection of all lands and historical and natural resources in Hawai'i's State parks (Hawai'i Revised Statutes, Sections 184-3 and 184-5). Within State parks, approvals are required from the Board to erect communications equipment (such as aerials, antennas and transmitters), vacation cabins, and concession facilities. Activities requiring permits from DLNR include limited camping, lodging (e.g., private and State cabins), fresh-water fishing, and hiking on certain trails. Uses allowed without a permit include limited collecting of renewable products (fruits, berries, flowers, seeds, and pine cones) for personal use; hiking on most trails; picnicking; and mountain biking (unless posted signs indicate otherwise).

Within Maui County, Maui and Moloka'i both feature State parks. The following State parks are located on Maui:

— Wainapanapa State Park: this 122-acre State Park is located on the eastern most part of the island encompassing remote, wild, low-cliffed volcanic coastline. Activities allowed in the park include lodging, camping, picnicking, shore fishing and hiking.

— 'Iao Valley State Park: this 6.2-acre State Park is located in 'Iao Valley in the western portion of the island. It has a scenic viewpoint of the 'Iao Needle, an erosional feature which abruptly rises 1,200 feet from the valley floor.

— Polipoli Spring State Park: this 10-acre State Park is at 6,200 feet elevation in Kula Forest Reserve. Activities allowed in the park include camping, lodging, and limited hunting

Moloka'i has one State park:

— Pala'au State Park: located at the end of Kalae Highway in north Moloka'i, Pala'au State Park contains a scenic overlook to Kalaupapa National Historical Park. The park offers picnicking and camping in an ironwood grove, and a short trail within the Park that leads to a stone believed to enhance fertility.

2.d.(6) Na Ala Hele State Trail and Access Program

The purpose of the Na Ala Hele State Trail and Access Program is to preserve and perpetuate the integrity, condition, naturalness and beauty of State trails and surrounding areas, and to protect environmental resources (Hawai'i Revised Statutes, Sections 198D-11 and 198D-6).

Activities allowed under this program by permit from DLNR include camping, hunting and fishing. Some trails are specified for commercial activity (e.g., commercial hikes on designated trails), but no commercial activity is permitted on a trail if it will compromise the quality and nature of the experience or cause any damage to the integrity or condition of the trail or the surrounding

environment. Prohibited uses include collecting, removing, injuring or killing a plant or animal; and introducing plants or wildlife.

2.d.(7) Natural Area Partnership (NAP) Program

Under the Natural Area Partnership (NAP) program, the State provides two-thirds of the management costs for private landowners who agree to permanently protect intact native ecosystems, essential habitat for threatened and endangered species, or areas with other significant biological resources. The NAP program can support a full range of management activities to protect, restore, or enhance significant native resources or geological features.

To qualify, the applicant must be a landowner or manager of private lands of high natural area quality. Other requirements include: (1) permanent dedication of the private lands through a transfer of fee title or a conservation easement to the State or a "cooperating entity" such as The Nature Conservancy of Hawai'i, and (2) management of the lands according to a detailed management plan approved by the Board of Land and Natural Resources. A "cooperating entity" is a private non-profit landholding organization or any other body deemed by DLNR to be able to assist in the management of natural areas.

NAP program funding is used to manage Waikamoi and Kapunakea Preserves and Pu'u Kukui Watershed Management Area in Maui; Kamakou, Mo'omomi, and Pelekunu Preserves in Moloka'i; and Kanepu'u Preserve in Lana'i. These areas are discussed more in detail later in the chapter under the "Other Land Management" section.

3. STATE SPECIES PROTECTIONS

3.a. Protection of Threatened and Endangered Wildlife and Ecosystems

The State has established various laws and administrative rules to protect threatened and endangered wildlife and their ecosystems. The Administrative Rule "Indigenous Wildlife, Endangered and Threatened Wildlife, and Introduced Wild Birds," implements a State act that was specifically designed to conserve, manage, protect and enhance indigenous wildlife, endangered and threatened wildlife, and introduced wild birds (Hawai'i Administrative Rules, Chapter 13-124). The State list of threatened and endangered species includes by reference species on the Federal list.

With regard to threatened and endangered wildlife species, prohibited activities include *taking*, possessing, processing, selling, offering for sale, or transporting these species. Nor can their nests be removed, damaged or disturbed, or their young, eggs, dead body or skin be removed from the State of Hawai'i. Nor does DLNR issue permits to destroy or otherwise control threatened or endangered species of wildlife or introduced wildlife. However, these rules do not apply to authorized employees of DLNR, the State Department of Agriculture, and the Service if the employees are acting in the course of their official duties. Also, "incidental *takes*" are allowed subject to approved habitat conservation plans and safe harbor agreements (Hawai'i Revised Statutes, Chapter 195D).

Similarly, the State has established various laws and administrative rules to protect threatened and endangered plants and their ecosystems, which in turn helps protect wildlife. The Administrative Rule "Threatened and Endangered Plants," implements a State act that was specifically designed to conserve, manage, protect and enhance native threatened and endangered

plants (Hawai‘i Revised Statutes, Sect. 195D). Prohibited activities include the taking, selling, delivering, carrying, shipping, transporting, or exporting of any native endangered or threatened plant. However, license holders may sell such plants if the plants are garden-grown. And "incidental *takes*" are allowed subject to approved habitat conservation plans and safe harbor agreements (Hawai‘i Revised Statutes, Chapter 195D).

As discussed above, additional protections of threatened and endangered wildlife and ecosystems are embedded in separate laws governing the State Conservation District, State Forest Reserves, State parks, and designated State trails. Also, the State has laws to protect, conserve and preserve ecosystems in NARs, as well as native ecosystems and important watersheds in State Forest Reserves. Under the NAP program, the State shares in the land management costs of private landowners who agree to permanently protect intact native ecosystems, essential habitat for threatened and endangered species, or areas with other significant biological resources. Limited taking of flora is allowed, but only in State parks and State Forest Reserves, and only if the flora is not endangered or threatened. In State parks, collecting or gathering reasonable quantities of natural renewable products–such as fruits, berries, flowers, seeds, and pine cones–is allowed for personal use without a permit. In Forest Reserves, limited colleting for personal use (e.g., *ti* leaves and bamboo) and limited commercial harvesting (e.g., timber, seedlings, greenery and tree ferns) is allowed by permit. Commercial forestry operations are allowed only with approval of the Board.

3.b. State Environmental Assessments and Environmental Impact Statements

Hawai‘i State law calls for efforts to prevent or eliminate damage to the environment and biosphere and to protect endangered species and indigenous plants and animals. To meet this and other goals, Hawai‘i's Environmental Impact Statement (EIS) law (Hawai‘i Revised Statutes 343), which is administered by the State Office of Environmental Quality Control (OEQC), requires that an Environmental Assessment (EA) and/or EIS be prepared for many development projects. The law requires that government give systematic consideration to the environmental, social and economic consequences of proposed development projects before granting permits for construction. For impacts on biological resources, OEQC guidelines call for biological surveys, an ecosystem impact analysis, and proposed mitigating measures. The requirements and guidelines apply to development projects in the State Agricultural, Urban, Rural and Conservation Districts.

4. COUNTY LAND MANAGEMENT

While the State manages land in the Conservation District, the counties have primary management responsibility for land in the other three State Districts: Agricultural, Urban and Rural. Also, development along the shoreline is subject to county regulation, even for land in the Conservation District.

4.a. Agricultural District

The Agricultural District includes "good" farm land and, from an agricultural perspective, land that is commonly referred to as "junk" land because it is unsuitable for farming or ranching. "Junk" land includes gulches, steep hillsides, rocky land and, on Maui and the Big Island, even relatively recent lava flows having little or no topsoil. This districting of "junk land" into the Agricultural District reflects the fact that this district is a catch-all category that includes all lands not otherwise categorized, regardless of the agricultural quality of the land.

Crops, livestock and grazing are permitted in the Agricultural District, as are accessory structures and farmhouses. Although land in the Agricultural District is not meant to be urbanized it is, in practice, sometimes used for large-lot subdivisions.

Listed species are found in some parts of the Agricultural District, particularly in gulches, on hillsides, and on some of the land that is used for low-intensity grazing. In many cases, the fact that the land is in the Agricultural District indirectly protects listed species by limiting urban sprawl.

4.b. Rural and Urban Districting

The State Urban and Rural Districts in each county are subject to county land use and development (commercial, industrial, residential, etc.) regulations, including county community plans, zoning, and building code regulations.

4.c. Coastal Zone Management Program and Special Management Areas

As mandated by Hawai‘i Coastal Zone Management program, the county has an additional layer of regulation that provides special controls on development in Special Management Areas (SMAs) located along the shoreline. Development in an SMA requires an SMA Use Permit from the county where the development is proposed. The intent is to avoid the permanent loss of valuable resources and to ensure adequate access to beaches, recreation areas and natural reserves (Hawai‘i Revised Statutes, Chapter 205A). Although SMAs are defined to include all lands extending not fewer than 100 yards inland from the shoreline, counties can amend their boundaries to achieve certain Costal Zone Management objectives. Amendments removing areas from an SMA are subject to State review for compliance with the coastal law.

4.d. County Boards of Water Supply

Boards of Water Supply in each county own and manage land in their island watersheds in order to protect their county’s supply of water. Watersheds generally include mountainous areas.

5. OTHER LAND MANAGEMENT

Other land management activities that are not the responsibility of the State or county governments are discussed below.

5.a. Preserves Involving The Nature Conservancy of Hawai‘i (TNCH)

The Nature Conservancy of Hawai‘i (TNCH) is a private, non-profit affiliate of a national organization that works with Federal, State and private partners to protect Hawai‘i’s natural areas that shelter native species. The mission of TNCH is to preserve Hawai‘i’s native plants, animals, and natural communities by protecting the lands and waters needed for their survival. In managing the preserves TNCH often takes advantage of Hawai‘i’s NAP program whereby the State provides two-thirds of the cost of managing private land dedicated to conservation (see discussion of NAP in Section 2.d.).

Management goals for the preserves include some or all of the following: (1) control non-native species; (2) suppress wildfire; (3) restore the integrity of dryland forest ecosystem; (4) reduce damage caused by feral ungulates and small mammals; and (5) prevent extinction of rare species in

the preserves. General management actions taken to attain the aforementioned goals include various fencing; monitoring and researching native plant species; hunting to control ungulate population; controlling weeds; and other various programs to prevent wildfire, control non-native plants, etc. Brief descriptions of the preserves in Maui County with TNCH involvement are presented below.

Maui maintains the following preserves:

— Waikamoi and Kapunakea Preserves

Waikamoi Preserve on the northeast flank of Haleakala is a 5,230-acre sanctuary for hundreds of native Hawaiian species and a vital watershed for Upcountry Maui. The Haleakala Ranch Company conveyed the management rights to TNCH in 1983. The 1,264-acre Kapunakea Preserve in the West Maui Mountains was established in 1992 when Amfac/JMB Hawai‘i, Inc. granted TNCH a perpetual conservation easement over the area.

— Pu‘u Kukui Watershed Management Area

Located on the West Maui Mountains and owned by Maui Land & Pineapple Co., Ltd., the 8,600-acre Pu‘u Kukui Watershed Management Area (WMA) is the largest single private nature preserve in Hawai‘i. Seven listed species are known to exist in this WMA.

Moloka‘i maintains the following preserves:

— Pelekunu Preserve (5,714 acres)

Located along Moloka‘i’s extremely rugged north coast, featuring the tallest sea cliffs in the world, Pelekunu Preserve protects one of Hawai‘i’s last remaining free-flowing streams. The Preserve is also home to at least seven native aquatic species. The land is owned by the Nature Conservancy, who purchased the land primarily from Moloka‘i Ranch, Ltd. in 1987.

— Kamakou Preserve (2,274 acres)

Kamakou Preserve is a lush rain forest located in the mountainous interior of East Moloka‘i near the summit of the island’s highest mountain. The Preserve contains 37 rare plant species, of which 18 are listed as federally endangered, and contains habitat for five native forest birds and five rare native land snail species. It is also home to countless native insects, snails, and a unique array of birds. The land is owned by Moloka‘i Ranch, Ltd., which, in 1982, granted a conservation easement to TNCH to restore the area and protect it in perpetuity.

— Mo‘omomi Preserve (921 acres)

The Mo‘omomi Preserve is located on the northwest coast of West Moloka‘i. Its windswept dunes shelter more rare coastal native grasses and shrubs than any other single place in the main Hawaiian islands, as well as nests of the endangered green sea turtle and sites of Hawaiian prehistory, paleontology and geology. The Preserve was created in 1988 on land purchased by TNCH.

Lanaʻi maintains one preserve:

— Kanepuʻu Preserve

The 590-acre Kanepuʻu Preserve, in the northwest central portion of the island on its western plateau, contains the largest remnants of Hawaiʻi's extremely rare *olopua/lama* dryland forest and is home to 49 plant species found nowhere else in the world. The Kanepuʻu Preserve contains the Kanepuʻu Trail, which has eight stations with interpretive signs describing particular features of natural or cultural significance in the Preserve. The Service reports one listed plant species in this Preserve.

The area has been protected since 1918, when George Munro (a naturalist and rancher) worked to slow the erosion that had already removed much of the topsoil from the western plateau. Over 30 years, Munro removed feral pigs, planted windbreaks, and erected fences to protect *lama* (native ebony) and *olopua* (native olive) from introduced cattle, pigs, sheep, and axis deer. Munro's legacy was carried forth by Hui Malama Pono O Lanaʻi, a community group that remains active in managing the area. In 1991, Castle & Cooke granted a conservation easement to TNCH to continue to restore the forest and ensure its long-term protection.

5.b. Watershed Partnerships

5.b.(1) Maui Watershed Partnerships

Maui has two Watershed Partnerships—the East Maui Watershed Partnership (EMWP), covering about 100,000 acres of watershed, and the West Maui Mountains Watershed Partnership (WMMWP) of about 50,000 acres. These large areas encompass:

— Most of Haleakala National Park,
— State forest reserves,
— State NARs,
— Manawainui Plant Sanctuary,
— State-managed Hunting Units,
— State hiking trails,
— County Board of Water Supply-managed areas,
— Waikamoi and Kapunakea Preserves (see above), and
— Pu'u Kukui Watershed Management Area (see above)

In addition, these areas are designated as Protective and Limited Subzones of the Conservation District and, in the EMWP, the Agricultural District.

EMWP began in 1991 as DLNR, the National Park Service (Haleakala National Park), TNCH and private landowners came together as a group to protect the watershed. Since its inception, EMWP has served as a model for similar watershed partnerships on Maui and other Hawaiian islands. The East Maui watershed hosts at least 63 rare plant species and a greater concentration of rare and endangered birds than any other place in the United States. It also serves as the largest source of harvested surface water in Hawai`i by providing more than 60 billion gallons of fresh water to East and Central Maui's agricultural, residential, and commercial economies.

WMMWP began in 1998 and its members include the State, TNCH, the Maui County Board of Water Supply, and private landowners. WMMWP is modeled after EMWP in its structure and purpose. The West Maui Mountains hosts more than 126 rare natural communities, plants, and animals. The watershed also serves as the second largest harvested source of surface water in Hawai'i by providing about 29 billion gallons of water per year to meet residential, commercial, and agricultural needs in West and Central Maui.

Participants in the Watershed Partnerships pool their expertise and other resources to implement an active watershed management program. The basic objective is to protect the watershed ecosystems in perpetuity. Watershed management goals focus on water and watershed resource monitoring, pest animal control, weed control, public education and awareness, and management of infrastructure improvements. Various conservation projects are planned and/or carried out in the watersheds to meet the management goals; these projects often involve installation of strategic fences, removal of ungulates and control of invasive weeds.

5.b.(2) Moloka‘i: East Moloka‘i Watershed Partnership

Moloka‘i’s sole watershed partnership, the East Moloka‘i Watershed Partnership (EMWP), was formed in late 1999. It encompasses about 22,000 acres extending from the mountainous interior of East Moloka‘i down to both the north and south shorelines. The area includes the Kalaupapa Historical National Park, the island’s two NARs, Pelekunu and Kamakou Preserves (see above), and State-managed hunting units. The area encompasses considerable land in the Conservation and Agriculture Districts and a small amount of land in the Urban District.

Membership in the EMWP includes private landowners (Kamehameha Schools, Kapualei Ranch), the State DLNR Division of Forestry and Wildlife, TNCH, Maui County, the Maui Board of Water Supply, Ke Aupuni Lokahi Enterprise Community Governance Board (a grassroots community organization), and Federal agencies (the National Park Service, the Environmental Protection Agency, NRCS, the U.S. Geological Services, and the Service).

The main focus of the partnership is to protect and enhance high-quality native Hawaiian rain forest communities. Using the traditional *ahupua‘a* (i.e., Hawaiian land division) approach to dividing land for resource management, watersheds are to be protected from the mountain-top to the sea. Participants in the EMWP share expertise and provide funding and other resources to implement an active watershed management program designed to maintain and increase the watershed capacity and reduce erosion. Upper elevations (above 3,500 feet) are to be kept free of feral animals by installing contour fencing. At mid-elevations (1,000 to 3,500 feet), goat populations are to be reduced to allow recovery of vegetation. Also, a monitoring system will be established to help with long-range planning.

The initial focus of EMWP’s efforts will be the Kamalo/Kapualei watershed project on the south side of the island. The goal of this project is to protect and restore 2,000 acres of native rainforest and shrub land by fencing and removing feral goats and pigs from the upper elevations. An existing five mile long fence may be extended in both east and west directions as neighboring landowners agree to participate.

5.b.(3) Lana‘i: Lana‘ihale Watershed Partnership

The summit of Lana‘i’s only mountain, Lana‘ihale, is the home of a valuable watershed for Lana‘i’s aquifer. It is estimated that about 50 percent of the water in the Lana‘i aquifer comes not from rain but from “fog drip”, which occurs when the trees and ferns in the upper regions of the mountain rake moisture from passing clouds. Many of the trees and plants in the summit region were started from seedlings 100 years ago by George Munro.

Over the years ungulates—first sheep, then goats and cattle—eroded gullies and damaged this watershed. In recent years, axis deer have begun chewing on saplings, rubbing away bark on older trees, and grazing on grass and shrubs that would otherwise help hold the soil.

Realizing the importance of the watershed to the island of Lana‘i, Castle & Cooke, in partnership with the Service, NRCS, DLNR and other agencies discussed above, has embarked on a 10-year program to rebuild the forest, restore the watershed, and protect native plants and their habitats. The cost is estimated at about $1.5 million over 10 years, half of which is to be provided by the Federal and State agencies and half by Castle & Cooke. The plan is to (1) fence off 3,580 acres at Lana‘ihale summit in three sections; (2) conduct a public hunt to rid each area of axis deer; and (3) plant native plants and thousands of trees.

5.c. National Tropical Botanical Gardens

The National Tropical Botanical Garden (NTBG) is dedicated to the conservation of tropical plant diversity, particularly rare and endangered species. Within Maui County, the NTBG operates one garden on Maui.

The 122-acre Kahanu Garden is on the Hana coast along the far eastern shores of Maui. Concentrating on plants of value to the people of Polynesia, Micronesia and Melanesia, Kahanu Garden has the world’s largest collection of breadfruit and also contains the massive Pi‘ilanihale Heiau, which is believed to be the largest ancient place of worship in Polynesia. The garden is surrounded by an expansive native pandanus forest.

5.d Kaho‘olawe: Kaho‘olawe Island Reserve

Used as a bomb target by the U.S. Department of Defense (DoD) for many years, the management and use of Kaho‘olawe has changed significantly in the recent past. In late 1990, DoD stopped using Kaho‘olawe for bombing and target practice. Further, the U.S. Navy has cleared 10,000 acres of surface ordnance and eradicated the population of introduced goats. Also, soil conservation and revegetation programs were instituted to restore and revive the environment. In 1993, the Hawai‘i State Legislature established the Kaho‘olawe Island Reserve to protect the entire island and surrounding coastal waters extending two miles seaward, and established the Kaho‘olawe Island Reserve Commission (KIRC) under Native Hawaiian control to manage the island. In 1994, the U.S. Navy signed a deed returning Kaho‘olawe to Hawai‘i.

By Hawai‘i law, the Kaho‘olawe Island Reserve is to be used solely and exclusively, in perpetuity, for: (1) the preservation and practice of all rights customarily and traditionally exercised by Native Hawaiians for cultural, spiritual, and subsistence purposes; (2) the preservation and protection of the Reserve’s archaeological, historical, and environmental resources; (3) rehabilitation, revegetation, habitat restoration, and preservation; and (4) education. Commercial uses are strictly prohibited in the Reserve.

Congress authorized $400 million to clean the island and restore its cultural and natural resources. The entire island is being cleared of surface ordnance to be reasonably safe for human access. Selected areas will be cleared for specific uses including revegetation with native species, trails and roads, cultural sites, camping areas, and educational facilities.

The U.S. Navy is consulting with the Service under section 7 of the Act to ensure the protection of threatened and endangered species during the ordnance clearing activities. However, the KIRC's 1998 environmental restoration plan for Kaho'olawe does not address specific management actions to protect and conserve endangered plant species.

APPROACH TO THE ECONOMIC IMPACT ANALYSIS[11]

CHAPTER V

This chapter presents the approach used in Chapter VI to estimate the economic impacts of the section 7 listing and critical habitat provisions of the Act on projects, land uses and activities in proposed critical habitat for particular species. First, the scope of the economic analysis is described. This is followed by a discussion of the analytical concepts and steps used to conduct the analysis.

1. SCOPE OF THE ANALYSIS

The parameters below define the scope of the economic analysis.

1.a. Time Horizon for the Analysis

A 10-year time horizon is used because many landowners and managers do not have specific plans for projects beyond 10 years. In addition, the forecasts in this analysis of future economic activity are based on current socioeconomic trends and the current level of technology, both of which are likely to change over the long term.

1.b. Projects, Land Uses and Activities Subject to Analysis

The analysis focuses primarily on the "reasonably foreseeable" projects, land uses, and activities that could affect the physical and biological features of the proposed critical habitat units. In turn, these are the activities that could be affected by the critical habitat designation.

"Reasonably foreseeable" projects, land uses, and activities are defined for the purposes of this report as those which are (1) currently authorized, permitted, or funded; (2) proposed in plans currently available to the public; or (3) projected or likely to occur within the next 10 years based on (a) recent economic or land-use trends, development patterns, evolving technologies, competitive advantages, etc., and (b) limits imposed by land-use controls, access, terrain, infrastructure, and other restrictions on development. Current and future activities that could potentially result in section 7 consultations and/or project modifications are considered to be reasonably foreseeable.

[11] **Note to Reader:** Readers who are already familiar with the approach to the analysis may wish to skip this chapter and proceed to the economic analysis in Chapter VI.

2. ANALYTICAL CONCEPTS AND STEPS

The approach used to estimate the economic impacts on specific projects, land uses and activities in areas proposed for critical habitat involved, as appropriate, the analytical concepts and steps described below.

2.a. Background Information

In order to provide context for the analysis, and to the extent that information was reasonably available, background information was obtained on projects, land uses, and activities that may potentially be affected by the proposed designation. Depending upon the situation, this background information included some or all of the following: (1) the location of a project, land use, or activity; (2) a description of the project, land use, or activity, including its magnitude; (3) the amount of economic activity associated with the project, land use, or activity (e.g., revenues and employment); (4) past section 7 consultations, project modifications and associated costs; and (5) whether the project site is within the geographic area known to be *occupied* by listed species other than those in the current proposal.

2.b. *Federal Involvement*

For the current and planned projects, land uses, and activities that may affect the physical and biological features of the proposed critical habitat units, the next step in the analysis was to determine *Federal involvement*. As discussed in Chapter III, Federal agencies must consult with the Service whenever an activity they fund, authorize, or carry out may affect designated critical habitat. When consultations concern an activity on Federal lands, the relevant Federal agency consults with the Service. When consultations involve an activity proposed by a State or local government or by a private entity, the Federal "Action agency" to the activity consults with the Service.

Activities on State, county, municipal and private lands that do not have a *Federal nexus* (i.e., they do not involve Federal funding, a Federal permit, or other Federal actions) are not restricted by critical habitat designation. Therefore, these activities were not addressed further in the analysis.

In practice, not every single project, land use, and activity that has a *Federal nexus* has been subject to section 7 consultation with the Service. Thus, the analysis was further confined to those projects, land uses, and activities which are, in practice, likely to be subject to consultation. This assessment was based on a review of past consultations, current practices, and the professional judgments of Service and other Federal agency staff.

2.c. Exclusion of Man-made Features and Structures

In practice, the critical habitat provisions of section 7 do not apply to the operation and maintenance (O&M) of existing man-made features and structures because these features and structures normally do not contain, and are not likely to develop, any *primary constituent elements*. Examples of man-made features and structures include buildings, roads, aqueducts, telecommunications equipment, arboreta and gardens, and *heiau* (indigenous places of worship or shrines). As a result, O&M of man-made features and structures were not considered further in the analysis.

An equivalent interpretation is that existing man-made features and structures are unmapped holes that are within the boundaries of a critical habitat unit, but are not part of the unit.

2.d. Existing Protections

The next step in the analysis involved identifying the impacts on activities that were expected to result from existing protections unrelated to section 7 (e.g., other existing Federal, State, and county land-use controls and environmental protections). If some other existing statute, regulation, or policy limits or prohibits a project, land use, or activity, the economic impacts associated with those limitations or prohibitions are not attributable to section 7 listing provisions and/or critical habitat provisions. For example, State protections include land-use restrictions for activities in the State Conservation District and specific protections of threatened and endangered species and their ecosystems.

2.e. Consultations and Project Modifications

For current and planned projects, land uses, and activities that are likely to be subject to consultations under section 7 of the Act, the next step in the analysis was to estimate (1) the quantity and nature of the consultations (e.g., formal or informal); and (2) changes that are likely to occur in such items as project designs, schedules, land uses, activities and programs.

The estimates reflect the availability of information which, in many cases, was limited (e.g., the outcome of future consultations will not be known until they occur).

2.f. Economic Costs

The next step in the analysis was to estimate the costs of consultations and the changes to projects, land uses and activities prompted by implementing the section 7 provisions. The types of economic costs that were considered included, but were not limited to, changes in revenues, costs, and property values. The analysis then determined what proportion of those section 7-related costs were attributable solely to the critical habitat provisions of section 7 (as opposed to the listing provisions).

2.g. Qualitative Impacts

In some cases, costs were described but were not quantified for one or more of the following reasons: (1) the economic impacts attributable to both the species listing and the critical habitat are expected to be small; (2) the probability that the impacts will occur is small; (3) the impacts are highly speculative; or (4) data needed to quantify impacts are not reasonably available.

2.h. Economic Benefits

The final step in the analysis was to estimate the benefits (e.g., species preservation) associated with the section 7 listing and critical habitat provisions. In most cases, a qualitative discussion of benefits is provided because market prices or existing economic studies on which to base values are not available (e.g., the economic value of preserving certain species).

3. SOURCES OF INFORMATION

The approach described above relied primarily on information provided by the Service (GIS map overlays, acreage tables, public testimony and comment letters on prior critical habitat proposals, etc.); the State Department of Land and Natural Resources (DLNR); the State Department of Business, Economic Development & Tourism (DBEDT); county planning and finance departments; other Federal, State and county agencies; the private landowner and land managers; affected companies; and other interested parties. Public documents used included the proposed rule (including the preamble), *Hawai'i Revised Statutes* and *Hawai'i Administrative Rules* related to land use, *The State of Hawai'i Data Book,* applicable county land-use plans, and property tax data.

ECONOMIC COSTS AND BENEFITS **CHAPTER VI**

1. INTRODUCTION

As noted in the Preface, the Service may exclude an area from critical habitat designation if it determines that the benefits of excluding the area outweigh the benefits of inclusion. To aid in this determination, this chapter presents an analysis of the section 7-related economic costs and benefits associated with listing the plants as threatened and endangered species and with designating critical habitat for the plants. However, the Service cannot exclude an area if it determines that the exclusion will result in the extinction of the species.

As explained in Chapter V, the approach used in this economic analysis involves estimating both (1) the total section 7-related economic costs and benefits (also referred to as economic impacts) of the plant listings and critical habitat designation, and (2) the subset of these costs and benefits that is solely attributable to critical habitat designation. As a result, for each potential impact, the analysis presents two estimates:

— **Total Section 7 Costs and Benefits.** These estimates include the economic impacts likely to occur from implementing both the species listing provision and the critical habitat provision of section 7 of the Act.

— **Costs and Benefits Attributable to Critical Habitat.** These estimates represent those portions of the section 7-related economic impacts that are most likely attributable to the proposed plants critical habitat designation but not to the plant listings.

The discussion and analysis of costs and benefits in this chapter is divided into the following sections: section 7 consultation history and typical costs (Section 2), direct section 7-related costs (Section 3), indirect costs (Section 4), potential impacts on small entities (Section 5), and section 7-related economic benefits (Section 6). A summary of the direct and indirect costs and benefits is given in Section 7. For some land-use activities and projects, the designation of critical habitat may generate both direct and indirect costs, or both costs and benefits, etc. As a result, the analysis of economic impacts for some land-use activities and projects is split among two or more sections, as appropriate.

It is important to note that it has been the practice of Action agencies in Hawai‘i to consult with the Service on activities occurring in areas with known listed plant populations. This cautionary approach, instituted prior to the proposal for critical habitat designation, is likely in recognition that disturbance to a single plant population could possibly jeopardize the continued

existence of the species. Therefore, the following analysis assumes that section 7 consultation would take place on the listing of the plants.

2. SECTION 7 CONSULTATIONS

In order to provide a context for the analysis in Section 3 below, this section gives a summary of the past consultations and project modifications that concerned one or more of the listed plants. It also presents the costs generally associated with section 7 consultations, biological surveys and associated project modifications. This information is used in Section 3 below to estimate future section 7-related economic impacts.

2.a. History of Section 7 Consultations and Project Modifications

As discussed earlier, although there is no *take* provision for plants under the Federal Endangered Species Act, it has been the practice of Action agencies in Hawai'i to consult with the Service on the listing of plants because of the *take* provision under the State Endangered Species Act. The consultation records illustrate this history (see Chapter IV, Section 3 and Hawai‘i Revised Statutes, Chapter 195D). Service records indicate that from the time the plants were listed between 1991 and 1999 until critical habitat was proposed, the Service conducted one formal and many informal section 7 consultations affecting the listed plants. The formal consultation related to the proposed Kahului Airport Runway expansion and involved activities located outside the proposed critical habitat. Of the informal consultations, only 11 addressed activities occurring within the proposed critical habitat:

— In 1993, the Service conducted an internal consultation on a request for the collection of leaves, branches, shoot tips and seeds to a scientist conducting genetic and evolutionary studies on two endangered species found in Haleakala National Park. Because the data obtained would be useful in developing management actions to ensure the long-term survival of the species and because there were limits on the amount of plant material to be collected, the Service found that the activity was not likely to jeopardize the existence of the species.

— In March 1995, the Service conducted an internal consultation regarding Federal Aid in Wildlife Restoration (commonly known as Pittman-Robertson) funding for a series of Department of Land and Natural Resources (DLNR) projects Statewide, including some on Maui.

— In October 1996, the Hawai‘i Army National Guard initiated an informal consultation regarding the effects of the Hawai‘i Army National Guard training activities at Kanaio National Guard Training Area in East Maui. The area contained one listed plant species. The Service recommended that strict rules be enforced against smoking while training, that fires and the use of signal flares be prohibited, and that vehicles, boots, clothing, gear and equipment be cleaned and visually inspected prior to entry into the area. Upon adoption of these recommendations, the Service concurred that the training activities were not likely to adversely affect listed plant species.

— In January 1998, the United States Department of Agriculture (USDA) initiated informal consultation regarding a proposal to remove feral pigs using dogs in the Waikamoi and Kapunakea Preserves on Maui. The Service recommended that clean boot procedures be implemented to prevent the introduction of invasive species, that existing trails be used whenever possible, that areas where listed plants are known to occur be avoided to prevent trampling, and if possible, that a botanist familiar with the area accompany the crew. The Service concluded that the activity was not likely to adversely affect any listed species.

— In May 1999, the Service conducted an internal consultation for a conservation project in the Pu‘u Kukui Watershed involving fencing. No modifications were required because the project would benefit threatened and endangered plants and improve habitat by excluding feral ungulates.

— In February 2000, the Service conducted three internal consultations for conservation projects in East Maui (Kahikinui, Pu‘u Makua and Auwahi) involving fencing, management of ungulate control and outplanting. No modifications were required because the projects were intended to benefit threatened and endangered plants and improve the habitat.

— In March 2001, the Service completed an internal informal consultation regarding Pittman-Robertson funding for a series of DLNR projects. The Service approved with some modification 65 of 67 game-management projects Statewide proposed by DLNR, some of which were planned in the proposed critical habitat. Appendix VI-A presents a discussion of the outcome of this consultation.

— In April 2001, the National Park Service (NPS) initiated an informal consultation regarding planned resurfacing of Park roads and parking lots above the Halemau‘u Trailhead parking lot. One listed plant species occurred in close proximity to the project sites. Because the resurfacing would be conducted within the footprint of already paved areas, the Service concluded that the project was not likely to adversely affect the listed plant.

— In June 2001, NPS initiated informal consultation regarding planned replacement of the Summit comfort station and the supporting utilities systems to meet accessibility requirements. NPS intended to establish a buffer zone around the listed plant found nearby, but outside, the construction area, to protect it during construction. Based on the proposed protection measures, the Service concluded that the proposed action was not likely to adversely affect the listed plant species.

2.b. Cost of a Typical Section 7 Consultation, Biological Survey and Project Modification

2.b.(1) Focus of Consultation

For the plants, the proposed rule indicates that future section 7 consultations are likely to focus on projects and activities with a nexus that could directly or indirectly adversely affect critical habitat, including:

— Activities that appreciably degrade or destroy the *primary constituent elements* for the plants including the following: overgrazing; maintaining feral ungulate levels; clearing or cutting native live trees and shrubs (e.g., woodcutting, bulldozing, construction, road building, mining, herbicide application); introducing or enabling the spread of non-native species; taking actions that pose a risk of fire; etc.

— Activities that alter watershed characteristics in ways that would appreciably reduce groundwater recharge or alter natural, dynamic wetland, or vegetative communities. Such activities include new water diversion or impoundment, excess groundwater pumping, manipulation of vegetation such as timber harvesting, residential or commercial development, and grazing of livestock or horses that degrades watershed values.

— Rural residential construction that includes concrete pads for foundations and the installation of septic systems.

— Recreational activities that appreciably degrade vegetation.

— Mining sand or other minerals.

— Introducing or encouraging the spread of non-native plant species.

— Importing non-native species for research, agriculture, and aquaculture, and releasing biological control agents.

2.b.(2) Cost of Consultation

As discussed in Chapter III, participants in a consultation may include the Service, the Federal Applicant or Federal Action agency, and possibly a non-Federal applicant. Although the Service does not charge fees for its consultations, participants in consultations normally spend time assembling information about the site and their proposed project or activity; preparing for one or more meetings; participating in meetings; arranging biological surveys and any associated reports; and responding to correspondence and phone calls.

For three levels of complexity (Low, Medium or High), Table VI-1 gives the estimated cost to those participating in consultations with the Service. The estimate is based on: (1) a review of consultation records across the country related to other critical habitat rulemakings; (2) the typical amount of time spent by all participants; and (3) the relevant standard hourly rates and overhead allowances for the Service, other Federal agencies, and private applicants in Hawai‘i.

Table VI-1 Estimated Cost of a Section 7 Consultation			
Item	**Low**	**Medium**	**High**
Consultation			
Federal Action Agency or Federal Applicant	$2,200	$6,400	$10,700
U.S. Fish and Wildlife Service	$1,600	$5,100	$10,000
Total for Federal Agencies	**$3,800**	**$11,500**	**$20,700**
Non-Federal Applicant (if any)	$1,400	$4,200	$8,200
Total (if a Non-Federal Applicant)	**$5,200**	**$15,700**	**$28,900**
Source: Project consultants and U.S. Office of Personnel Management, 2002 General Schedule Salary Table.			

As indicated in the table, consultation costs could range from as little as $3,800 to as much as $20,700 if just Federal agencies are involved, and from $5,200 to $28,900 if there is a non-Federal applicant.

2.b.(3) Cost of Biological Survey

The cost of a biological survey for a particular piece of land and a technical report on the findings varies according to a number of parameters:

— Size of the land area: The consultation history for a variety of listed plants suggests that projects are of three sizes: small (fewer than ten acres), medium (11-100 acres), or large (101-500 acres). Large land areas take longer to survey and thus are more costly to survey.

— Ease of access to the site: Some sites can be reached easily while others can be reached only by helicopter. More remote sites are more costly to survey.

— Type of ecosystem: Forested areas are more difficult to survey than open areas and therefore are more costly to survey.

Based on these parameters, Table VI-2 presents estimates of the cost to survey land areas with different combinations of features and to prepare the report on the findings. The estimates assume the following: (1) a three-person team can survey 100 acres in one day if the area is open, and 30 acres if it is forested; (2) sites having "easy" access can be reached in an hour of driving or hiking, "medium" access takes 2 hours, and "difficult" access takes a half-hour by helicopter; (3) biologist and field-assistant services are $50 to $80 per hour; (4) travel costs for the survey team are $1,000 to $1,500 for round-trip airfare from O‘ahu, car rental, and per diem; and (5) helicopter time is $700 per hour.

Table VI-2 Estimated Cost of Biological Surveys for Threatened and Endangered Plants			
Size and Location	**Accessibility**		
	Easy	**Medium**	**Difficult**
10 Acres, Open or Forested Area	$3,700	$3,900	$5,100
100 Acres, Open Area	$4,500	$4,900	$5,900
100 Acres, Forested Area	$10,200	$11,400	$14,900
500 Acres, Open Area	$15,900	$17,700	$22,900
500 Acres, Forested Area	$44,600	$50,600	$67,900
Source: Project consultants. Based on discussions with a Hawai'i-based biological consulting firm in 2002.			

As Table VI-2 indicates, the costs of a biological survey could range from as little as $3,700 in a ten-acre, easily accessible, open area to as much as $67,900 in 500-acre, remote, forested area. The estimates are based on average projects of each type; specific projects of each type may require more or less survey effort than the average used in the cost estimates, depending on the characteristics. These costs are typically borne by the applicant.

2.b.(4) Costs of Project Modifications

As discussed in Section 2.a above, no formal consultations involving activities within the proposed critical habitat have yet occurred, and the informal consultations did not result in significant project modifications. Thus, this analysis does not determine the cost of a typical project modification. Instead, project modification costs are determined on a project-by-project basis in Section 3 below.

3. DIRECT SECTION 7-RELATED COSTS

The following analysis of direct section 7-related costs addresses ongoing land-use activities in the proposed critical habitat, but excludes certain areas and man-made features and structures that are not considered to be part of the proposed critical habitat because they do not contain the *primary constituent elements* of listed plants (see Chapter I). The analysis also addresses foreseeable developments and major land-use changes in the proposed critical habitat.

3.a Management of Game Hunting

Presented below is an analysis of the direct economic impacts of the proposed critical habitat designation on the management of game hunting on State lands. Additional impacts are addressed in Section 4, "Indirect Costs," while Appendices VI-A and VI-B provide background information on hunting and game-mammal management.

3.a.(1) Affected Hunting Acreage

Ten of the 26 proposed critical habitat units on Maui overlap with State-managed hunting lands:

— Units A and D1 overlap with parts of State Hunting Unit A.

— Unit B1 contains a portion of State Hunting Unit N2 (Kahakuloa NAR).

— Unit B2 contains a portion of State Hunting Unit F.

— Unit H contains a portion of State Hunting Unit C (Papaanui).

— Units I1, I2, and I3 overlap with State Hunting Unit C (Kula Forest Reserve and cooperative lease area).

— Unit K contains a portion of State Hunting Units A and B.

— Unit L contains a portion of State Hunting Unit B and D.

These overlapping areas represent approximately 32,000 acres, or 30 percent of the total State-managed Hunting Units on Maui. More specifically, critical habitat overlaps with about 71 percent of the State Hunting Units in East Maui, about 12 percent of the State Hunting Units in West Maui, about 50 percent of the Hunting units in far West Maui (west of Hanawai NAR), and about 62 percent of the State Hunting Units in Central Maui (Kula).

In addition, proposed critical habitat Unit D1 overlaps with areas under consideration by the State Division of Forestry and Wildlife for establishing a public game bird hunting program. (DLNR, Memorandum from Resource Management Forester to District Manager regarding Draft Environmental Assessment, Kaheawa Pastures 20 MW Windfarm, August 11, 1998).

The designation in Units H, I1, I2 and I3 overlaps with an area popular with both hunters and hikers due to its proximity to the large communities in central Maui, good access (a paved but narrow and winding road), features (dense forest, complex of interconnecting trails, State recreation area), and unique hunting opportunities. For example, this area is open daily, whereas most of the State Hunting Units are only open on weekends. In addition, this is the only area where hunting dogs are not allowed.

Additional private lands on Maui are available for game hunting, though not managed by DLNR as State Hunting Units. However, public access to private lands is limited and subject to change, based on landowners' actions.

There are no State-managed Hunting Units on Kaho‘olawe.

3.a.(2) Direct Economic Impacts on Game-Management Projects

Potential Project or Activity, Next Ten Years: Game management and hunting-related projects.

Based on a Statewide consultation on hunting in 2001 (see Appendix VI-A), future projects may include lease payments for a 1,000-acre piece of property in the Kula Forest Reserve, maintenance or construction of hunter check-in stations and game mammal surveys. Fencing or installation of covers on existing game bird watering units has largely been completed.

Federal Involvement: Federal cost-sharing of many DLNR game-management projects.

The *Federal nexus* is the Federal funding provided by the Service to DLNR to restore and rehabilitate wildlife habitat and to support wildlife management research. The funding is provided as part of the Pittman-Robertson Act (see Appendix VI-A, Section 7).

Other Land Management: All of the State hunting areas in the proposed critical habitat are also in Forest Reserves or NARs. (See Table I-1).

Consultation and Costs:

- Total Section 7 Costs: $4,100 to $12,700

No consultations are required for game management projects that 1) do not affect listed species or their habitats; 2) are entirely funded by the State (even if they do affect listed species or their habitats); or 3) are undertaken by private parties on privately-owned land.

The Service has historically conducted internal consultations involving DLNR on game-management projects that are partially funded under the Pittman-Robertson Act due to the *Federal nexus*, the presence of listed plants (and wildlife) throughout much of the State hunting lands, and the *take* provision of the State Endangered Species Act. However, if the proposed critical habitat is designated, the scope of future section 7 consultations will be expanded to include portions of the critical habitat where no listed species are present. The main issue for the consultation is likely to be the impact of ungulate activity on listed plants and their habitat.

Statewide consultations between DLNR and the Service occur every five years, and the last consultation took place in 2001. Therefore, two programmatic consultations are likely over the next ten years. The 2001 consultation cost the Service and DLNR approximately $27,600. The cost was high because new issues were raised. Without critical habitat designation, information from the Service and DLNR suggests that the next two consultations would have each cost about 50 to 75 percent of the 2001 consultation, or about $13,800 to $20,700 Statewide. Two consultations over the next ten years would increase the total Statewide cost to about $27,600 to $41,400.

Many of the projects proposed for Pittman-Robertson funding apply to all six islands. Thus, by allocating the portion of consultation costs attributable to each island equally, Maui's share over the next ten years would be $4,600 to $6,900 ($27,600 x 1/6; $41,400 x 1/6). Alternatively, 10.5 percent of the State's hunting areas are located on Maui. Assuming consultation costs were incurred in relation to acreage, Maui's share of consultation costs over the next ten years would be $2,900 to $4,300 ($27,600 x 10.5%; $41,400 x 10.5%). Using these two methods to allocate Maui's share of the consultation costs, a conservative estimate over the next ten years would be $2,900 to $6,900.

However, future consultations may address areas that have not been considered before critical habitat designation. Given the fact that no plant-related critical habitat consultations have taken place in Hawai'i, no estimates are available for the cost increase associated with the designation. However, while the consultations will likely address about the same number of game-management projects, involve about the same number of staff, and involve staff who are already familiar with the issues, it is likely that future consultations will involve a much larger area. Given these factors, the increase in costs is estimated at 20 to 50 percent. This increases the ten-year consultation cost to between $3,500 and $10,400.

Also, the 2001 consultation on Pittman-Robertson funding may be reinitiated due to critical habitat designation. During the reinitiation, the Service is likely to address areas that have not been considered before critical habitat designation. However, since the issues relating to Maui were resolved in the original consultation, the reinitiation is likely to involve a low level of effort. Similar to the above, the assumed cost is 20 to 50 percent of the initial cost of $27,600. Depending on the method of allocation, Maui's share of the 2001 consultation costs was between $2,900 to $4,600. ($27,600 x 10.5%; $27,600 x 1/6). About 20 to 50 percent of this amount is $600 to $2,300.

Thus, the total projected consultation costs for Maui over the next ten years are $4,100 to $12,700:

- One reinitiation at $600 to $2,300
- Two new programmatic consultations at $1,750 to $5,200 each.

All of the consultation costs are conservatively assigned to the plants, even though the consultation may also address listed wildlife species that may be present.

- Costs Attributable to Critical Habitat: $1,200 to $5,800

Without the critical habitat designation, consultation costs are estimated at $2,900 to $6,900 (see above). Thus, the additional amount would be attributable to critical habitat.

Anticipated Project Modification and Costs:

- Total Section 7 Costs: $115,500 to $185,000

Maui does not have any State hunting areas that are managed to maintain or enhance game mammal populations. As a result, project modifications on Maui have been fairly minor, and have

historically included the fencing or covering of game bird watering units to prevent their use by game mammals, a modification which is largely completed for existing units. Approval of use of Pittman-Robertson funds for lease payments on a 1,000-acre privately owned property within the Kula Forest Reserve required clarification that the area leased would be managed for game birds and would not be managed to maintain or enhance game mammal populations.

For the most part, DLNR can avoid costly section 7 project modifications by using Pittman-Robertson funds for game management projects that do not adversely affect listed species or their habitat and, if needed, use only State funds on projects that the Service believes could have adverse impacts. By doing this a *Federal nexus* is avoided. Thus, section 7 project-modification costs are expected to be modest.

On the other hand, under this strategy, DLNR will have to find sources of funding other than Federal monies for those projects that could adversely affect critical habitat. It is likely that DLNR will simply use funds previously allocated to other game management projects. For example, the 2001 consultation resulted in funds being expended to prevent game mammals from using game-bird watering stations at an average cost of about $1,000 each.

Over the next two consultations, the costs of project modifications are expected to be similar to the 2001 costs, or about $110,000 Statewide for each consultation. Depending on the method of allocation, over the ten-year period, the Maui share would be between $23,100 and $37,000 (2 x $110,000 x 10.5% (acreage); 2 x $110,000 x 1/6 (pro rata share)).

However, because future consultations will address areas that were not typically considered before critical habitat designation, this may result in project modifications to cover the additional areas. As noted earlier, no previous plant-related critical habitat consultations exist from which to estimate the increase in project modification costs. Therefore, absent such information, this analysis makes the conservative assumption that the cost of past project modifications only addresses the part of the Hunting Units that overlaps with the *occupied* proposed critical habitat. Of the approximately 32,000 acres of hunting land proposed for critical habitat designation, approximately 20 percent is considered *occupied* by listed plant populations. Therefore, because future project modifications may be required in an area five times the size of that at present, the estimated costs associated with the future project modifications are between $115,500 to $185,000 for the ten-year period.

- Costs Attributable to Critical Habitat: $92,400 to $148,000

Without the critical habitat designation, project modification costs are estimated at $23,100 to $37,000 (see above). Thus, any additional amount would be attributable to critical habitat.

3.b. National Parks

3.b.(1) Haleakala National Park Fence Installation Project

Located in East Maui, Haleakala National Park maintains habitat for various listed species including the listed plants. The National Park Service (NPS) implements ongoing conservation projects to protect and manage the lands within the Park. Its conservation projects include control of or research on non-native ungulates, rodents, invertebrates and weeds; fire control; and habitat restoration (see Chapter IV, Section 1.f. for more details).

The NPS is planning a project in the proposed critical habitat Unit K that will involve installing approximately three miles of boundary fence to keep ungulates out. The project began in 1989, but came to a halt due to lack of funding. During this initial phase of the project, NPS finished building the upper portion of the fence. NPS is planning to restart the project and is still in the process of finalizing the boundary line for the lower portion of the fence. When the project first began, NPS did not consult with the Service since no listed species were known from the area. However, due to the presence of the listed plants around the area and the proposed critical habitat designation, NPS is planning to initiate a consultation with the Service once the fence boundary line is determined.

3.b.(2) Direct Economic Impact on Fence Installation Project

Potential Activity, Next Ten Years: Installing a boundary fence

Federal Involvement: NPS as the Action Agency

Presence of Other Listed Species and Critical Habitat for Other Species: possible, depending upon the fence boundary line.

Consultations and Costs

- Total Section 7 Cost: $11,500

The cost estimate is based on (1) one consultation; (2) the Medium cost from Table VI-1 of a consultation with a Federal agency as the Applicant; and (3) no survey since the Service believes that the NPS biologists at the Park have the most updated information on listed species within the Park's boundaries and has been relying on information from them in the past. All of the consultation costs are conservatively assigned to the listed plants, even though the consultation may also address listed wildlife species that may be present.

- Cost Attributable to Critical Habitat: $7,700

As noted above, listed plants are known to occur in the vicinity of the project. Thus, it is likely that NPS would have initiated the consultation even without the proposed critical habitat

designation. However, the consultation is likely to involve higher level of effort as the Service addresses more areas and/or concerns due to critical habitat. Absent critical habitat, the consultation is likely to involve the Low cost from Table VI-I. Therefore, the incremental cost between a Low cost and Medium cost consultation is attributable to critical habitat.

Anticipated Project Modifications and Cost: None

The mission of NPS is to preserve unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education and inspiration of this and future generations. NPS is already planning to taking measures to minimize possible adverse impact on the listed species around the area by ensuring that no listed species occur in a ten-feet parameter that would be drawn for both sides of the fence boundary. Also, the project is likely to be beneficial to the listed plants by preventing ungulates from entering areas where the listed plants are known to occur. For these reasons, project modifications are not expected.

3.b.(3) Haleakala National Park Trail Improvement Project

NPS maintains several trails within Haleakala National Park, including the Sliding Sands Trail, the Halemau‘u Trail and the Kaupo Trail. The maintenance of trails and roads would not be subject to section 7 consultation because they are existing man-made features.

However, the construction of new trails or access roads could be subject to section 7 consultation. NPS is planning a project in the proposed critical habitat Unit J that will involve improving a historical trail. This trail has not been maintained for the past 20 to 30 years. As a result, many parts of the trail are covered by vegetation and are rugged. The current condition of the trail makes it unsafe for hikers to travel on it. NPS is planning to improve the safety of the trail by uprooting vegetation and leveling the path. In addition to the trail's poor condition, an endangered seabird is presently nesting on a portion of the trail. Therefore, NPS is planning to reroute the trail to avoid disturbing the endangered species and its habitat. The extensive work planned for this trail goes beyond routine maintenance, and therefore, this analysis treats this project as a new construction.

3.b.(4) Direct Economic Impact on the Trail Improvement Project

Potential Activity, Next Ten Years: Improving a historical trail

Federal Involvement: NPS as the Action Agency

Presence of Other Listed Species and Critical Habitat for Other Species: An endangered seabird

Consultations and Costs

- Total Section 7 Cost: $11,500

The cost estimate is based on (1) one consultation; (2) the Medium cost from Table VI-1 of a consultation with a Federal agency as the Applicant; and (3) no survey since the Service believes that the NPS biologists at the Park have the most updated information on listed species within the Park's boundaries and has been relying on information from them in the past. All of the consultation costs are conservatively assigned to the listed plants, even though the consultation may also address listed wildlife species that may be present.

! Cost Attributable to Critical Habitat: $7,700

As noted above, an endangered seabird and its habitat is known to occupy a part of the trail. Thus, it is likely that the consultation would have occurred even without the proposed critical habitat designation. However, the consultation is likely to involve higher level of effort as the Service addresses more areas and/or concerns due to critical habitat. Absent critical habitat, the consultation is likely to involve the Low cost from Table VI-I. Therefore, the incremental cost between a Low cost and Medium cost consultation is attributable to critical habitat.

Anticipated Project Modifications and Cost: Minor

This project will be largely within the existing footprint of an old trail without extending or widening it. In addition, the project plan already addresses the presence of the endangered seabird, and NPS plans to reroute the trail to go around the endangered species and allow enough distance from the trail to its habitat. Therefore, project modifications, if any, are expected to be minor.

3.b.(5) Establishment of New National Parks Within Proposed Critical Habitat

United States Representative Patsy Mink (D-HI) asked the Department of the Interior to study the feasibility of creating a national park along six miles of coastline from La Perouse Bay to Kanaloa Point. Proposed Unit F is contained within this study area. The proposal has the support of the Hawai‘i House of Representatives, the Hawai‘i Senate, the Maui County Council, the Maui Hotel Association, and the Maui County Cultural Resources Commission.

However, the preliminary study prepared by the Department of the Interior found that the proposed area lacks resources of nationwide significance. Given the findings of the preliminary study and the complexity involved in becoming a National Park, this analysis concludes that it is unlikely that Unit F will become part of the National Parks System within the next ten years. Therefore, no consultation costs or project modifications involved in such a proposal have been included in this analysis.

3.c. State Parks and Trails

3.c.(1) Wai‘anapanapa State Park

Wai‘anapanapa State Park is located near Hana along the eastern volcanic coastline. Presently, less than an acre of proposed Unit G6 overlaps with the park. However, DLNR is

considering expanding this park and extending an existing trail. If DLNR does expand the park, the overlap with Unit G6 is likely to increase as it expands along the coastline. No other developments are expected to take place in the expanded area and DLNR plans to preserve the area in its natural state. Although DLNR is still considering whether to expand the park, this analysis makes the conservative assumption that the expansion will take place.

In the event that DLNR expands the park, a *Federal nexus* may occur due to Federal funding received from NPS. DLNR has received funding in the past from NPS for various activities in the State parks.

3.c.(2) Direct Economic Impact on Wai‘anapanapa State Park Project

Potential Activity, Next Ten Years: Expanding Wai‘anapanapa State Park

Federal Involvement: Federal funding from NPS

Presence of Other Listed Species and Critical Habitat for Other Species: None

Consultations and Costs

- Total Section 7 Cost: $19,400

The cost estimate is based on (1) one consultation; (2) the Medium cost from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) survey of ten acres of open area with easy access from Table VI-2.

- Cost Attributable to Critical Habitat: $0

Listed plants are known to occur in the vicinity of the project. NPS has historically consulted with the Service, prior to critical habitat designation, on activities that could affect listed plant populations. Thus, it is likely that the consultation would have occurred even without the proposed critical habitat designation. Since almost all of Unit G6 is considered *occupied*, none of the costs associated with the consultation are attributable to the proposed critical habitat designation.

Anticipated Project Modifications and Cost: none

Because DLNR is still in the preliminary stage of planning the project, the agency has indicated that it is able to avoid adversely impacting the plants in the area by rerouting the trail in its plan. Moreover, DLNR is planning to preserve the surrounding area in its natural state. Therefore, no project modifications are expected for this project.

3.c.(3) Polipoli Spring State Recreational Area Project

Polipoli Spring State Recreation Area is located within the Kula Forest Reserve in East Maui near the eastern boundary of Unit I4. It is a popular, but remote, recreational area with picnic tables, a cabin, and a camping site. DLNR manages this area as a part of the State park system (see Chapter IV, Section 2 for details).

Under the provision of the Americans with Disability Act (ADA), DLNR is mandated to improve all its State recreational facilities to make all parts of the facilities accessible to those with disabilities. As such, it is anticipated that Polipoli Spring State Recreational Area will undergo renovation within the next several years. Renovation might involve activities such as paving side roads for wheelchair accessibility and building a few additional parking spaces near the recreational area.

3.c.(4) Direct Economic Impact on Polipoli Spring State Recreation Area Project

Potential Activity, Next Ten Years: Renovating the recreational area for compliance with ADA

Federal Involvement: Possible Federal funding from NPS

Presence of Other Listed Species and Critical Habitat for Other Species: None

Consultations and Costs

- Total Section 7 Cost: $8,900 to $19,400

The cost estimate is based on (1) one consultation; (2) the Low to Medium cost from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) survey of ten acres of open area with easy access from Table VI-2.

- Cost Attributable to Critical Habitat: $8,900 to $19,400

NPS is not likely to consult with the Service absent critical habitat since this site is considered *unoccupied*. Therefore, all costs associated with the consultation are attributable to the proposed critical habitat.

Anticipated Project Modifications and Cost: Minor

The Service expects this project to involve minor improvements and activities on areas already disturbed by the travelers. Therefore, project modifications, if any, are expected to be minor.

3.c.(5) Na Ala Hele Trail and Access System

The proposed critical habitat units contain numerous hiking trails, four-wheel-drive trails, and unpaved access roads (see Table I-1). The Na Ala Hele Trails and Access Program, a program within the Division of Forestry of Wildlife of DLNR, and other divisions of DLNR, such as the Division of State Parks and the Division of Forestry and Wildlife, maintain several trails and access roads located within or partially within the proposed critical habitat, including the trails and roads within Polipoli Spring State Recreation Area and the Forest Reserves (Units A, B1, D1, H, I1, I2, I3, I4, K, L). The maintenance of trails and roads would not be subject to section 7 consultation because they are existing man-made features.

However, the construction of new trails or access roads could be subject to section 7 consultation. Na Ala Hele has proposed two new trails on Maui, both of which are located within proposed critical habitat: the ʻOhai Trail is proposed for Unit C3 and the Kahakapao Loop Trail is along the border of Unit L. Activities involved in trail building include removing vegetation, defining the trail corridor and constructing the trail bed. According to the Draft Environmental Assessments prepared for each of these trails pursuant to State law (HRS Chapter 343), the construction will be financed solely with State funds and the use of volunteers.

3.c.(6) Direct Economic Impact on New Na Ala Hele Trails

Potential Project or Activity, Next Ten Years: Construction of two new trails

Federal involvement: None

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated from these activities because there is no *Federal involvement*.

3.d. Department of Hawaiian Home Lands (DHHL)

The mission of DHHL is to manage the Hawaiian Home Lands trust effectively and to develop and deliver land to Native Hawaiians. Approximately 21,491 acres in the proposed critical habitat are managed by DHHL: 2,051 acres in Unit E, 13 acres in Unit G4, and 19,427 acres in Unit H.

3.d.(1) Kahikinui Development

The *ahupuaʻa* of Kahikinui, much of which is contained in proposed critical habitat Unit H, has been largely uninhabited since the mid-1800s.[12] Remotely located on the southeastern flank of

[12] An *ahupuaʻa* is a traditional Hawaiian land division usually extending from the uplands to the sea. Pukui and Elbert, 1986, Hawaiian Dictionary.

Haleakala, Kahikinui was designated as Hawaiian Home Lands in 1920, and DHHL leased out the land for cattle ranching until 1992. While the area was once home to about 1,500 Native Hawaiians and provided habitat to native plants and animals, the area is currently sparsely inhabited, due to its dry and windy climate and rugged terrain.

Of the 19,430 acres owned by DHHL in Unit H, approximately 1,000 acres have been subdivided and leased to approximately 74 individual lessees as part of the DHHL Kahikinui Kuleana Homestead pilot program. Beneficiaries are granted raw land; the only improvement to be provided by DHHL is a bladed roadway network to provide access to individual parcels. Infrastructure, including housing units, water, sewage, solid waste disposal, communications, and energy, are the responsibility of the lessees. This unique program provides a homesteading alternative while giving beneficiaries immediate access to the land and the opportunity to participate in the creation of a community.

Ka ‘Ohana O Kahikinui, a beneficiary community-based organization, was active in assisting DHHL in creating the Kahikinui Kuleana Homestead program and remains important in the resettlement of Kahikinui, as many of those receiving leases are members of the ‘Ohana. The vision for Kahikinui is to create a self-governing and self-sufficient intentional community that enables residents to reestablish ties with the land, the environment, and their Hawaiian heritage. A strong sense of stewardship towards the land of Kahikinui is an integral part of the vision.

At present, very few homes have been constructed and as of March, 2001, Kahikinui had an official population of 12 people. As noted earlier, beneficiaries are responsible for the construction of their own homes and for the necessary infrastructure. There are no plans to extend electrical service to the area; instead, energy is to be provided by generators and solar collectors. There are no plans to development wastewater infrastructure; instead, beneficiaries are required to dispose of wastewater through portable wastewater systems. There are no plans at the present time to extend water service to the area; instead, residents have to transport water. The development of a catchment system is also possible in the future. For the construction activities at each individual site, there is no known *Federal nexus*.

It is expected that the community at Kahikinui will participate in the management and care for the DHHL land within Unit H outside the immediate homestead area. DHHL has leased approximately 7,050 acres in the Kahikinui Forest to Living Indigenous Forest Ecosystems, Inc. (LIFE), another beneficiary community-based non-profit organization for stewardship purposes that works closely with Ka ‘Ohana O Kahikinui. Through a community-based planning process on Maui, a plan to protect and restore the native forest and watershed on the *mauka* slopes was completed. In addition, a Community Based Economic Development and Makai Management Plan was developed in collaboration with the University of Hawai‘i Department of Urban & Regional Planning.

Through these plans, the community has specified a variety of possible activities for economic development purposes. These include:

- Forest restoration and sustainable tree farming

- Development of a recreational access management program, including: access control points, a system of visitor permits, the monitoring of total use, and institution of a small fee to be used for resources protection and management

- Establishment of a hydroponics program to enable farming with less water and less pesticides

- Implementation of an eco-cultural tours program

- Organization of an agricultural cooperative and community pasture

The community has also identified certain planned management actions, including

- Fencing *makai* of Pi‘ilani Highway

- Fencing *mauka* in the Kahikinui Forest Reserve (largely completed)

- Exclosure fencing of areas with rare or endangered plants

- Removal of ungulates (both *makai* and within the Forest Reserve)

- Restoration of native plant vegetation (*makai)*

- Reforestation

- Removal of alien vegetation, including gorse

It is likely the community will seek Federal funding from any available source to support activities that benefit the entire community, especially for the stewardship and conservation activities. For example, the USDA has been identified as a possible funding source to support the creation of an agricultural cooperative and community pasture, and the Service has provided funding in the past for conservation activities, including fencing and revegetation, within Kahikinui.

3.d.(2) Direct Economic Impact on Kahikinui Development

Potential Project or Activity, Next Ten Years: Economic development activities; conservation activities such as fencing, replanting, and removal of alien vegetation

*Federal Involvemen*t: Federal funding

Presence of Other Listed Species: Possible, depending on location

Consultation Costs:

- Total Section 7 Costs: $15,700 to $78,500

Estimate based on (1) one to five consultations in the next ten years, (2) Medium cost from Table VI-1 of a consultation with a Federal agency as the applicant and the involvement of a non-Federal applicant, and (3) no biological survey.

The small size of the community currently at Kahikinui makes it difficult to estimate which of the economic development activities are most likely to occur, as well as how many are likely to occur, with Federal funding, within the next ten years. Because beneficiaries will simultaneously be responsible for the development of their own homes, they may lack the time to participate in the development of communal economic development activities. However, the development of communal economic development activities may take priority if beneficiaries are waiting upon economic opportunities in Kahikinui before joining the community. Similarly, the conditions make it difficult to predict how many conservation projects may occur in the next ten years. The estimate of one to five consultations takes into account these circumstances and the number of past activities in the area and provides a range that reasonably reflects the amount of expected activity in the next ten years.

The types of possible projects, such as fencing and revegetation, are generally likely to require Low to Medium effort. However, because of the uncertainty about what the project may involve and the location of the project, a Medium cost is conservatively attributed to these consultations. No biological surveys are anticipated because of the amount of existing information regarding Kahikinui and the existence of earlier surveys conducted as part of the environmental review process for the creation of the Kuleana Homestead program.

While other listed species may be present, the entire cost of the consultation is conservatively assigned to the plants, even though the consultation may also address the other listed species.

- Costs Attributable to Critical Habitat: $15,700 to $78,500

A botanical survey was conducted for the Homestead site area as part of the Environmental Assessment process. No listed threatened or endangered species were found at the homestead site; however, a few threatened and endangered species have been reported within five miles of the site. Because the area is largely *unoccupied* by listed species, however, this analysis conservatively attributes all the costs to critical habitat.

Anticipated Project Modification and Costs: None

Because restoration of the area is an integral part of the vision for Kahikinui, it is expected that any proposed project will be planned to protect listed plant populations and to enhance, rather

than adversely modify, critical habitat. As such, project modifications, if any, are expected to be minimal.

3.d.(3) Pu‘u o Kali Development

Proposed Unit E contains approximately 2,051 acres managed by DHHL. Immediately adjacent to, but outside the proposed critical habitat, are two DHHL developments, the Kula Residence Lots and the Keokea Farm Lots. Within the proposed critical habitat, there are no immediate plans for development and the majority of the land within Unit E is leased to an individual for pasture purposes. In addition, DHHL licensed the Service and the Seacology Foundation to fence and manage approximately 200 acres of endangered dryland forest at Pu‘u o Kali. The fencing project, designed to keep deer out of the native *wiliwili* forest, has been completed.

With the conservation project now complete, there are no known activities with a *Federal nexus* on the DHHL land in Unit E.

3.d.(4) Direct Economic Impact on Pu'u o Kali

Potential Project or Activity, Next Ten Years: Pasturage

*Federal Involvemen*t: None known

Consultation Costs and Anticipated Project Modifications: None

No consultations or project modifications are anticipated because there are no known activities with a *Federal nexus* on the DHHL land in Unit E.

3.e. Kaho‘olawe

3.e.(1) Activities on Kaho‘olawe

From 1941 to 1994, Kaho‘olawe and its surrounding waters were used by the U.S. Navy as a live-fire training area. In 1994, the island of Kaho‘olawe was returned to the State of Hawai‘i under the control of the Kaho‘olawe Island Reserve Commission (KIRC). That same year, Congress authorized funding for a ten-year program to clear the island of unexploded ordnance, under the direction of the U.S. Navy.

Under Hawai‘i law, Kaho‘olawe is to be used solely and exclusively for: (1) the preservation and practices of all rights customarily and traditionally exercised by Native Hawaiians for cultural, spiritual and subsistence purposes; (2) the preservation and protection of the Reserve’s archaeological, historical and environmental resources; (3) rehabilitation, revegetation, habitat restoration and preservation; and (4) education.

Initial clean-up goals were to result in surface clearance of the entire island and subsurface clearance of approximately 30 percent of the island to support specific uses. However, it is presently estimated that the entire island will not be cleared of unexploded ordinance by 2003. Most of the western third of the island will not receive surface clearance and less than ten percent of the entire island will receive subsurface clearance by 2003.

In recognition of the dangers remaining due to unexploded ordnance, the Reserve is divided into six Use Areas based on the level of cleanup referenced in the Navy Cleanup Plan and the KIRC Use Plan. Two Use Areas are in Reserve Waters. The remaining four Areas are on the island. Level 1 and Level 2 areas have received subsurface clearance and are identified as the primary locations for human activity. Level 3 areas have received surface clearance only and have been identified as unspecified restoration areas and open lands. Level 4 areas are uncleared lands where access remains restricted.

Seven of the eight Level 1 sites, all located along the Kahoʻolawe coastline, are within proposed critical habitat Unit Ka A. Many of the Level 2 sites are outside the proposed critical habitat, but some roads are within Unit Ka A. The remaining acreage in Unit Ka A is either Open land or Uncleared land (i.e., Level 3 or 4).

Existing and anticipated activities on Kahoʻolawe within the proposed critical habitat include:

- Construction and use of educational and cultural centers/work camps, including: water catchment, shelter, storage, cooking space, and helipad (for emergency use) at three sites.

- Construction and use of overnight campsites with minimal facilities at four locations.

- Limited restoration activities, including revegetation and planting of native vegetation; development of nurseries; soil stabilization and terracing; climatological monitoring stations; creation of botanical/wildlife preserves; creation of buffer zones and fire breaks; development of a water collection and storage system; and preservation of cultural/historical sites.

- Building of roads and trails to link areas.

Past consultations regarding activities on Kahoʻolawe have focused on the unexploded ordnance removal activities, including controlled burns. There is no history of consultation for other activities.

November 2003 marks the end of the Navy's congressionally-mandated cleanup period. After that point, KIRC is likely to seek some form of Federal assistance, from agencies such as Natural Resources Conservation Service (NRCS) and the National Endowment of the Arts, to support continued restoration efforts.

3.e.(2) Direct Economic Impact on Kaho'olawe

Potential Project or Activity, Next Ten Years: Restoration activities

*Federal Involvemen*t: Possible Federal funding

Presence of Other Listed Species: Possible, depending on location

Other Land Management: Kaho‘olawe Island Reserve

Consultation Costs:

- Total Section 7 Costs: $10,400 to $78,500

Estimate based on (1) two to five consultations in the next ten years, (2) Low to Medium cost from Table VI-1 of a consultation with a Federal agency as the applicant and the involvement of a non-Federal agency, and (3) no biological survey. No new biological surveys are anticipated because of the existing biological information regarding Kaho‘olawe gathered during the ongoing restoration activities. While other listed species may be present, the entire cost of the consultation is conservatively assigned to the plants, even though the consultation may also address the other listed species.

The number of consultations will depend on the Federal funding sought by KIRC and the scope of the consultation.

- Costs Attributable to Critical Habitat: $10,400 to $78,500

The U.S. Navy has consulted several times in the past with the Service to ensure that threatened and endangered plants and other listed species are protected during ordnance removal. The consideration of impact on listed plants occurred during the context of a multi-species consultation, and it is uncertain whether the Navy would have initiated consultation on the listed plants alone. Because the vast majority (98 percent) of the proposed critical habitat is considered *unoccupied* by listed species and because the Navy would not be required to initiate consultation absent critical habitat designation, this analysis attributes all of the costs of consultation to critical habitat.

Anticipated Project Modification and Costs: Minor

The mandated management of the island is compatible with preservation of native species, including species that are listed as threatened or endangered. Given the context of Kaho‘olawe and the beneficial nature of planned future activities to the overall health of the island, project modifications, if any, are anticipated to be minor.

3.f. Watershed Partnerships and Other Conservation

3.f.(1) West Maui Mountains Watershed Partnership (WMMWP)

In 1998, State and private landowners officially formed the West Maui Mountains Watershed Partnership (WMMWP) for the purpose of protecting over 50,000 acres of valuable forests and watershed vegetation in high mountains of West Maui. Since its inception, the WMMWP has conducted various conservation projects such as fencing and weed control to support its management goals (see Chapter IV Section 5 for more details). Several Federal and State agencies, including the U.S. Environmental Protection Agency (EPA) and the Service, have provided funding to support these conservation projects in the watershed. WMMWP plans to continue applying for Service funding of future conservation projects and is presently preparing a proposal to apply for Federal funding from the U.S. Army Corps of Engineers (ACOE).

Within the next ten years, the WMMWP and the Service expect to conduct a programmatic consultation that addresses various types of conservation activities and their general location. By completing a programmatic consultation, the Service will be able to issue funding for WMMWP in the future without having to conduct a separate consultation for each individual conservation activity. However, the programmatic consultation would need to be reinitiated if there are changes in activities and/or location of the activities described in the initial consultation. This analysis makes the conservative assumption that the consultation will be reinitiated once or twice within the next ten years.

3.f.(2) Direct Economic Impact on WMMWP Projects

Potential Activity, Next Ten Years: Conservation projects such as fencing and weed control.

Federal Involvement: Federal funding from the EPA, ACOE and the Service.

Presence of Other Listed Species and Critical Habitat for Other Species: Very likely

Consultations and Costs

- Total Section 7 Cost: $44,600 to $60,300

The cost estimate is based on (1) one programmatic consultation and one to two reinitiations; (2) the High cost for the programmatic consultation and the Medium cost for the reinitiations from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) no biological survey since the Service is likely to rely on the WMMWP's knowledge of the resources in the watershed. All of the consultation costs are conservatively assigned to the listed plants, even though the consultation may also address listed wildlife species that may be present.

- Cost Attributable to Critical Habitat: $23,700 to $34,200

Various listed species are known to occur in the watershed. The Service historically has conducted internal consultations on activities funded by the Service that occur in areas with listed plant populations. Thus, it is likely that the consultation would have occurred even without the proposed critical habitat designation. However, the Service indicates that the presence of critical habitat causes increase in effort level of these consultations. Absent critical habitat, it is estimated that the programmatic consultation would involve Medium cost for the programmatic consultation ($15,700) and Low cost for the one to two reinitiations ($5,200 to $10,400). Therefore, the difference in costs is attributable to the proposed critical habitat designation.

Anticipated Project Modifications and Cost: None

Since the nature of the conservation projects in the watershed is beneficial, project modifications, if any, are likely to be extremely minor.

3.f.(3) East Maui Watershed Partnership (EMWP)

In 1991, several State, Federal, and private landowners in East Maui formed the EMWP to protect approximately 100,000 acres of East Maui watershed. Similar to WMMWP, EMWP has been conducting various conservation projects including fencing, trail building and weed control. While the State has provided most of the funding for these projects, some of the projects involved Federal agencies: NPS provided labor for some of the projects, and the Service provided funding for a specific project in the past. Although Federal funding has not been significant in the past, EMWP expects to apply for more Federal funding in the future, including funding from the Service.

As is the case with WMMWP, EMWP is likely to continue similar types of conservation projects in the future in order to reach its management goals. Therefore, the Service expects to conduct a programmatic consultation that addresses various types of EMWP's conservation activities and their general location. The Service will be able to issue funding and/or approve projects for EMWP in the future under this programmatic consultation without having to conduct a separate consultation for each project. However, the programmatic consultation would need to be reinitiated if there are changes in activities and/or location of the activities described in the initial consultation. This analysis makes the conservative assumption that the consultation will be reinitiated once or twice within the next ten years.

3.f.(4) Direct Economic Impact on EMWP Projects

Potential Activity, Next Ten Years: Conservation projects such as fencing, trail building and weed control.

Federal Involvement: Federal funding from the Service.

Presence of Other Listed Species and Critical Habitat for Other Species: Very likely

Consultations and Costs

- Total Section 7 Cost: $44,600 to $60,300

The cost estimate is based on (1) one programmatic consultation and one to two reinitiations of consultation; (2) the High cost for the programmatic consultation and the Medium cost for the reinitiations of consultation from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) no biological survey since the Service is likely to rely on the EMWP's knowledge of the resources in the watershed. All of the consultation costs are conservatively assigned to the listed plants, even though the consultation may also address listed wildlife species that may be present.

- Cost Attributable to Critical Habitat: $23,700 to $34,200

Various listed species are known to occur in the watershed. The Service historically has conducted internal consultations on activities funded by the Service that occur in areas with listed plant populations. Thus, it is likely that the consultation would have occurred even without the proposed critical habitat designation. However, the Service indicates that the presence of critical habitat causes increase in effort level of these consultations. Absent critical habitat, it is estimated that the programmatic consultation would involve Medium cost for the programmatic consultation ($15,700) and Low cost for the one to two reinitiations ($5,200 to $10,400). Therefore, the difference in costs is attributable to the critical habitat.

Anticipated Project Modifications and Cost: None

Since the nature of the conservation projects in the watershed is beneficial, project modifications, if any, are likely to be extremely minor.

3.f.(5) Kanaio Natural Area Reserve (NAR) Project

The Kanaio Natural Area Reserve is located within Unit H. DLNR is planning a project that will involve installing an exclosure fence to keep ungulates out of approximately 600 acres of land. This project is mostly funded by the Service, and the State provides the balance. DLNR is currently in the process of completing an environmental assessment for the project.

3.f.(6) Direct Economic Impact of Kanaio NAR Project

Potential Activity, Next Ten Years: Installing an exclosure fence

Federal Involvement: Federal funding from the Service

Presence of Other Listed Species and Critical Habitat for Other Species: None

Consultations and Costs

- Total Section 7 Cost: $10,100 to $20,600

The cost estimate is based on (1) one consultation; (2) the Low to Medium cost from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) survey of 100 acres of open area with medium access from Table VI-2.

- Cost Attributable to Critical Habitat: $0

The Service would have conducted an internal consultation on the project because all of Kanaio NAR overlaps with proposed critical habitat that is considered *occupied*. Therefore, none of the cost associated with consultation is attributable to the designation of critical habitat.

Anticipated Project Modifications and Cost: None

The goal of this project is to provide protection to the listed plants. Therefore, the project will be planned to minimize impacts on the plants. As a result, project modifications are not expected.

3.f.(7) Other Conservation Activities

Other conservation activities, though not immediately planned, are expected to occur within the next ten years. As discussed in Chapter IV, NRCS provides technical assistance and funding for landowners seeking to protect native habitat through the Wildlife Habitat Incentives Program (WHIP) and the Service provides funding for conservation activities through a variety of programs, including the Partners for Fish and Wildlife Program and the Coastal Program.

3.f.(8) Direct Economic Impact of Other Conservation Activities

Potential Activity, Next Ten Years: Conservation Activities

Federal Involvement: Federal funding from the Service or NRCS

Presence of Other Listed Species and Critical Habitat for Other Species: Depends on location

Consultations and Costs

- Total Section 7 Cost: $15,700 to $62,800

The cost estimate is based on (1) one to four consultations; (2) Medium cost from Table VI-1 of a consultation with the involvement of a non-Federal agency; and (3) no biological survey

because the Service is likely to rely on maps and information compiled by the Hawai'i Natural Heritage Program and the landowner's knowledge of resources in the conservation project area.

The estimated number of consultations is based on the fact that there are only 40 landowners (32 private) owning land inside the proposed critical habitat designation and that the EMWP and WMMWP overlap with significant portions of the proposed critical habitat and are likely to be the entities undertaking the projects in these areas (consultation costs associated with conservation activities on these areas have already been taken into account earlier in this subsection).

! Cost Attributable to Critical Habitat: $10,500 to $42,000

NRCS indicates that its current practice is to conduct consultations on all federally funded projects and the Service typically conducts an internal consultation on any Service-funded project. Because of the beneficial nature of future conservation projects, it is estimated that absent critical habitat designation, these consultations would involve Low cost from Table VI-1 ($5,200 to $20,800). NRCS has indicated that the designation of critical habitat is likely to increase the amount of time required to conduct the consultation, especially for newly designated *unoccupied* critical habitat areas. Therefore, with critical habitat designation, it is estimated that the consultations would involve Medium cost from Table VI-1. The incremental cost between a Low cost and Medium cost consultation is attributable to critical habitat.

Anticipated Project Modifications and Cost: None

Since the nature of the conservation projects is beneficial, project modifications, if any, are likely to be extremely minor.

3.g. Agriculture and Ranching Operations

Approximately 29,175 acres of land of the proposed critical habitat are within the State Agricultural District, in Units A, B2, C3, C4, D1, D2, E, G1, G3, G4, G5, H, I1, I2, I3, I4, K, and L. (See Table I-1). Of this land, 83 percent (24,084 acres) is located within Units E (3,432 acres) and H (20,652 acres).

Approximately 46 percent of this land is owned by private entities. Activities on this land include farming, cattle ranching, ecotourism (including horseback riding and hiking) and recreational hunting. The remaining land, except 83 acres in Unit K owned by the Federal government, is owned by the State and managed by DLNR or DHHL. The homestead settlement of Kahikinui (discussed earlier in Section 3.d) and part of the Kanaio Natural Area Reserve are located within the Agricultural District on State land. In addition, some of the State-managed land is protected as open space, and some is leased out as pasturage.

Even though the land in some proposed critical habitat units is in the Agricultural District, the habitat is outside the areas actively being cropped or grazed and therefore unaffected. For example, some units are located along sea cliffs (C3, C4, G1, G3, G4, and G5) and in mountainous

areas bordering State Agricultural land (K and L) where agricultural operations do not actually occur.

3.g.(1) Participation in Federally-sponsored Agricultural or Ranching-related programs

Ranching and agricultural activities can have a *Federal nexus* if a rancher or farmer receives a loan from the Federal Farm Service Agency, or receives a small grant from the NRCS to voluntarily adopt conservation practices that improve or maintain the quality of the natural resources in the area, most often through the Environmental Quality Incentives Program (EQIP).

3.g.(2) Direct Economic Impact of Participation in Federally-sponsored Agricultural or Ranching-Related Programs

Potential Project or Activity, Next Ten Years: Institution of environmentally friendly land use practices, including revegetation, reforestation and removal of noxious weeds.

*Federal Involvemen*t: Funding by NRCS, through the USDA

Future Consultation Costs:

- Total Section 7 Costs: $31,400 to $164,800

Estimate is based on the following: (1) two to eight consultations, (2) Medium cost from Table VI-1 of a consultation with a Federal agency as the Applicant and the involvement of a non-Federal entity, and (3) if needed, a biological survey of a 100-acre open site with easy to medium access. Although all past biological assessments in Hawai‘i have been done by NRCS staff, a project or activity involving a large area could require the farmer or rancher to engage the services of a biologist. Thus, the low estimate does not include the costs of a biological survey, while the high estimate assumes that each of the eight projects would require a biological survey of a 100-acre open site with medium access.

The estimated number of consultations over the next ten years is derived from the following:

- Approximately 233 farmers, ranchers and other agricultural producers instituted conservation practices in Hawai‘i through NRCS conservation programs during the period 1996-2001, and approximately 56 of these were in Maui County. The proposed critical habitat on Maui covers approximately 1.5 percent of the Agricultural land Statewide and seven percent of the Agricultural land in Maui County. Based on these data, three to four projects might be expected to have occurred in the proposed critical habitat over a five-year period (233*.015; 56*.07). Over the next ten years, this would amount to six to eight projects.

- Of the 56 projects in Maui County over the past five years, approximately two projects have occurred within the proposed critical habitat. Using this information to forecast future projects, approximately four projects might occur within the proposed critical habitat over the next ten years.

Thus, based on past participation, the estimated number of consultations over the next ten years is four to eight. However, the designation of critical habitat may encourage some landowners to forego participation in NRCS programs to avoid a *Federal nexus* (see Section 4.j. for more detail). If half of the eligible landowners with property in proposed critical habitat decide not to participate in NRCS programs to avoid a *Federal nexus*, then the estimated number of consultations could be two to four over the next ten years. At the same time, concerns about critical habitat designation may be reduced over the passage of time as the implications of the designation of critical habitat become clearer, and as a result, over a ten-year period, there may be no reduction in the number of projects within the proposed critical habitat. To account for both possibilities, this analysis presents the estimated number of consultations as a range. Thus, the estimated number of consultations over the next ten years is two to eight.

Finally, while the passage of the 2002 Farm Bill increased funding for conservation practices, competition for these funds is expected to increase as well as more landowners learn of the programs. Thus, no adjustment in the anticipated number of projects in the proposed critical habitat has been made to account for either factor.

- Costs Attributable to Critical Habitat: $21,000 to $92,000

NRCS indicates that its current practice is to conduct consultations on all federally funded projects. Because of the beneficial nature of the projects, it is estimated that absent critical habitat designation, these consultations would involve Low cost from Table VI-1 ($5,200) and either no biological survey or a survey of a reduced area surrounding listed plant populations ($0 to $3,900). Thus, the estimated cost absent critical habitat designation would be $10,400 to $72,800. NRCS has indicated that the designation of critical habitat is likely to increase the amount of time required to conduct the consultation, especially for newly designated unoccupied critical habitat areas. Therefore, with critical habitat designation, it is estimated that the consultations would involve Medium cost from Table VI-1. The incremental cost between a Low cost and Medium cost consultation is attributable to critical habitat.

<u>Anticipated Project Modification and Costs</u>:

- Total Section 7 Costs: $0 to $400,000

Because projects sponsored by the NRCS programs under the Farm Bill are generally beneficial in nature, it is unlikely that land management practices instituted with funding from these programs will adversely affect the listed plant species. However, the Service may recommend changes, such as the relocation of the planned project or activity to an area that does not affect critical habitat.

A landowner could decide to forego the Federal funding and cancel the contract with NRCS rather than make modifications identified through the section 7 consultation process with the Service. This would remove the *Federal involvement.* Funding under the EQIP program is limited to $50,000 over the life of the contract. Funding limitations under other NRCS programs vary, but historically have been less than $50,000 as well. Thus, $50,000 is the worst-case scenario of the costs of project modification for Farm Bill projects.

- Costs Attributable to Critical Habitat: $0 to $400,000

Because the location of future conservation projects on farming or ranching lands requiring consultation with the Service is as yet undetermined, it is difficult to estimate what proportion of project modifications are attributable to critical habitat. Because only 17 percent of the Agricultural land proposed for designation as critical habitat is considered *occupied* by listed species, it is more likely that future projects and activities, and the resulting suggested project modifications, will occur in critical habitat lacking existing plant populations. Thus, as a conservative measure, this analysis attributes all of the costs associated with project modifications to critical habitat.

3.h Electric Generation and Delivery

3.h.(1) Kaheawa Pastures 20 MW Windfarm

Zond Pacific, a subsidiary of Enron Wind Corporation, proposes to construct a 20 megawatt (MW) windfarm within the State Conservation District in an area known as Kaheawa Pastures. Most of the proposed development is located outside the proposed critical habitat designation, but approximately five of the 27 wind turbines are planned along the border of Unit D1, to the east of Manawainui Plant Sanctuary. It is possible that more detailed maps and surveys would reveal that the project lies entirely outside the proposed critical habitat. However, because of the proximity of the project to proposed critical habitat and because final siting of the turbines has not been completed, as a conservative measure this analysis assumes that the five turbines are within the proposed critical habitat.

Construction of the windfarm would include the following activities within the proposed critical habitat:

- Installation of five wind turbines approximately 400 feet apart, including excavation and construction of foundations (40 by 40 feet) and erection of support towers and transformers;
- Construction of a intrasite road network, consisting of one 11.5-foot wide road and spurs to each turbine; and
- Construction of an intrasite electrical distribution network connecting the turbines, including excavation and burying of all wires, and re-vegetation of the disturbed area.

As of June 2002, the project had submitted a final environmental impact statement (EIS), received a Conservation District use permit from DLNR, negotiated a power purchase agreement with Maui Electric Company, and received Federal Aviation Administration (FAA) approval of the 'Notice of Construction or Alteration.' Construction is projected to begin during 2002.

The Service commented on the project during the EIS process, concentrating on the possible impacts to listed bird species and recommending that the FAA initiate consultation with the Service. However, from a review of Service records, it does not appear that section 7 consultation between the FAA and the Service occurred.

No endangered plant species were encountered in the project area during the biological surveys conducted for the EIS. The EIS stated that the primary hazards to vegetation from the project were damage during construction and operation of the windfarm and invasion of non-native plants. Specific mitigation measures are planned, including conducting an additional botanical survey to site the turbines and roads to avoid areas of native plants, hiring a plant expert to supervise actual construction in or near areas with native plants, establishing an inspection station to reduce the possibility of introducing alien plant species by vehicles, and starting a native plant propagation program to reintroduce appropriate native plant species after construction.

3.h.(2) Direct Economic Impacts on Kaheawa Pastures 20 MW Windfarm

Potential Project or Activity, Next Ten Years: Construction of five wind turbines as part of 20 MW windfarm

Federal Involvement: FAA permit

Other Land Management: The proposed windfarm is located within the State Conservation District.

Consultations and Costs

- Total Section 7 Costs: $19,600

Estimate is based on the following: (1) one consultation, (2) Medium cost from Table VI-1 of a consultation with a Federal agency as the Applicant and the involvement of a non-Federal entity, and (3) a biological survey of ten acres with medium access.

- Cost Attributable to Critical Habitat: $19,600

From a review of Service records, it does not appear that the FAA consulted with the Service regarding this project. According to the Final EIS for the project, it appears that the FAA did not consult (and was not required to consult) because it did not determine that the project would impact an endangered or threatened species. Therefore, all of the consultation costs are attributable to critical habitat designation.

Anticipated Project Modifications and Costs:

- Total Section 7 Costs: $0 to $150,000

Because past surveys have not found evidence of any listed plant populations in the immediate project area, it is unlikely that the project will have a direct adverse impact on the listed species. However, the project could adversely modify the proposed critical habitat, especially as the area is considered by the Service to be *occupied* by listed plants.

The possible cost range for project modifications is broad, due to uncertainties about the project area. Specifically, the project area is located along the border of the proposed critical habitat. As such, it is possible that the project area does not contain all the *primary constituent elements* that characterize critical habitat. If this were to be the case, then no project modifications would be expected.

However, if the project area does contain the *primary constituent elements*, project modifications would be expected. One possible project modification would be to relocate the project to an area outside the proposed critical habitat or to a less sensitive area within the proposed critical habitat. Because of the proximity of the proposed project to the border of the critical habitat unit, relocation may not involve sufficient distances to trigger the need for a new Conservation District Use permit. However, if new permits are required for the changed location, the cost of obtaining a Conservation District Use Permit can be between $25,000 and $100,000 (based on information from planning consultants).

Other possible project modifications could include the preparation of additional botanical surveys, establishment of inspection programs to prevent non-native plant introduction, measures to minimize access by others to the site (to prevent non-native plant introduction), revegetation and replanting, relocating of plants, erosion control, fire control, and other measures to preserve and improve the existing habitat. These activities, if all required, could cost up to $50,000 (based on information from DLNR, NPS, FWS and private organizations). According to the EIS, Zond already intends to conduct another botanical survey and select final turbine locations to avoid native plant populations as a mitigation measure. In addition, an inspection program to reduce non-native plant introduction and a plant propagation program after construction, are already planned. While many of the possible project modifications have already been planned as part of the project, the cost of additional modifications resulting from consultation is estimated to range from $0 to $50,000 in case the existing mitigation measures are insufficient to prevent *adverse modification* to the critical habitat. These project modifications may be required in place of, or in addition to, the modification of relocating the project. Thus, the total estimated cost range for project modifications is between $0 and $150,000.

- Cost Attributable to Critical Habitat: $0 to $150,000

Without critical habitat designation, there would be no further consultation for this project. Thus, all costs associated with project modifications resulting from consultation are attributable to critical habitat.

3.h.(3) Maui Electric Company, Inc.

Maui Electric Company, Inc. indicates that no new transmission lines and no new power plants are planned for Maui in the next ten years within the proposed critical habitat. Because the high-voltage power transmission lines within the proposed critical habitat are existing structures, operation and maintenance of these features would not be subject to section 7 consultation.

Federal Involvement: None

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications involving electric power transmission lines are anticipated because there are no plans for new transmission lines.

3.i. Communications Facilities

3.i.(1) Hawai‘i Television Broadcasters Association Antennae

The Hawai‘i Television Broadcasters Association (HTBA) currently has a month-to-month revocable permit from DLNR for an existing antennae atop Haleakala. DLNR has indicated to HTBA that it will not grant permission for improvements necessary to comply with a Federal Communications Commission (FCC) mandate to broadcast in digital format, due, in part, to concerns expressed by the United States Air Force Maui Space Surveillance Complex and the observatories located at the Haleakala High Altitude Observatory Site about possible interference from the existing antennae. As a result, HTBA plans to relocate the antennae and has considered several sites, with a current preference for a site located on State land within the Conservation District, within proposed critical habitat Unit H. In addition to the construction of the antennae structure itself, the project will include the construction of supporting infrastructure, such as electric lines and roads. HTBA is likely to seek Federal funding, from the Department of Defense or from another source, to assist in covering the costs of the project.

3.i.(2) Direct Economic Impact on Hawai‘i Television Broadcasters Association Antennae

Potential Project or Activity, Next Ten Years: Construction of new broadcast antennae and related infrastructure

*Federal Involvemen*t: FCC permit; possible FAA permit; possible Federal funding

Presence of Other Listed Species: Possible, depending on location of facilities

Other Land Management: Preferred site is within the State Conservation District, within Polipoli Spring State Recreation Area

Consultation Costs:

- Total Section 7 Costs: $27,100 to $40,300

Estimate based on (1) one consultation, (2) Medium to High cost from Table VI-1 of a consultation with a Federal agency as the applicant and the involvement of a non-Federal applicant, and (3) the cost of a biological survey, based on a 100-acre forested site with medium access. Communications facilities generally have small footprints; however, the related infrastructure increases the size of the potentially affected area and is likely to pass through areas with medium access. The complexity of the consultation is expected to vary depending upon the siting of the related infrastructure – whether it runs from the top of Haleakala or comes up from the Kula area, with the former involving more complexity due to the remote nature of the terrain and the likelihood that the entire route would be located within proposed critical habitat.

- Costs Attributable to Critical Habitat: $0 to $40,300

Because a final decision has not been made regarding siting of the new antennae, it is difficult to determine whether consultation would occur absent critical habitat designation. Therefore, this analysis presents the costs attributable to critical habitat as a range to reflect this uncertainty.

Anticipated Project Modification and Costs:

- Total Section 7 Costs: $0 to $150,000

Due to the small footprint of communications facilities, it is likely that the facility will not adversely affect listed plant species or adversely modify critical habitat. However, the required supporting infrastructure, including the road and provision of electric lines, expand the area of disturbance. Depending upon the circumstances, such as the presence of a listed plant population, the precise nature of the construction, and the quality of the *primary constituent elements* in the area, it is possible that project modifications may be required to reduce impact to listed species or critical habitat.

The possible cost range for project modifications is broad, due to uncertainties about the project area. One possible project modification would be to relocate the project far enough away to mitigate the possible impact. If the siting change is made early in the permit process, then the cost of moving the site could be negligible. If new permits are required for the changed location, the cost of obtaining a Conservation District Use Permit can be between $25,000 and $100,000 (based on information from planning consultants).

Other possible project modifications could include the preparation of additional botanical surveys, establishment of inspection programs to prevent non-native plant introduction, measures to minimize access by others to the site (to prevent non-native plant introduction), revegetation and replanting, relocation of native plants, erosion control, fire control, and other measures to preserve and improve the existing habitat. These activities, if all required, could cost up to $50,000 (based

on information from DLNR, NPS, FWS and private organizations). These project modifications may be required in place of, or in addition to, the modification of relocating the project. Thus, the total estimated cost range for project modifications is between $0 and $150,000.

- Costs Attributable to Critical Habitat: $0 to $150,000

Because all consultation costs are conservatively attributed to critical habitat, the costs associated with any project modifications arising from these consultations are also attributed to critical habitat.

3.i.(3) Other Communication Facilities

The proposed critical habitat contains communications facilities in Unit H and I1. Permits are required from the Federal Aviation Administration (FAA) to ensure that communications facilities will not interfere with aircraft, and from the Federal Communications Commission (FCC) to operate the facility. Operations and maintenance of existing man-made features and structures are not subject to section 7 consultation. However, planned modifications and additions to the communications facilities in the critical habitat would be subject to consultation.

In 2001, the FCC completed a series of informal consultations on proposed communications antennae sites across the State. On Maui, the proposed sites are located in the developed areas of Kihei, Pukalani, Kapalua, Lahaina, Puunene, Wailuku, Paia, Maalaea, Kaahumanu, and Kauhale Makai. None of the proposed sites are in the proposed critical habitat. All of the consultations concerned listed birds; no listed plants were affected.

There are several existing communications facilities on the top of Haleakala on land leased from the State by private companies in Units H and I1. There is no history of consultation for these facilities.

A review of applications to the FCC indicates that there are no current plans to construct new communications facilities in proposed critical habitat. However, it is possible that additional applications will be filed in the next ten years. While the most recent FCC permits have been issued for antennae sites near the urban areas of Maui outside the proposed critical habitat, proposals for new antennae sites atop Haleakala remain possible. Because of this, the possibility of future consultations on communications facilities within critical habitat in the next ten years exists. It is conservatively estimated that one to two communications facilities that will require Federal permits will be sited in the proposed habitat within the next ten years.

3.i.(4) Direct Economic Impact on Other Communication Facilities

Potential Project or Activity, Next Ten Years: Permitting of one to two communications facilities

Federal Involvement: FCC and/or FAA permits

Presence of Other Listed Species: Possible, depending on location of facilities

Other Land Management: Possible, depending on location of facilities

Consultation Costs:

- Total Section 7 Costs: $8,900 to $39,200

Estimate based on (1) one to two consultations in the next ten years, (2) Low to Medium cost from Table VI-1 of a consultation with a Federal agency as the applicant and the involvement of a non-Federal applicant, and (3) the cost of a biological survey, based on a ten-acre open or forested site with easy to medium access. Communications facilities generally have small footprints and access to them could be easy to medium. While other listed species may be present, the entire cost of the consultation is conservatively assigned to the plants, even though the consultation may also address the other listed species.

- Costs Attributable to Critical Habitat: $8,900 to $39,200

Since there have been no consultations on Maui for communications facilities in the areas where listed plant species are found, it is difficult to determine whether a consultation would occur without critical habitat designation. Therefore, this analysis presents the costs attributable to critical habitat as a range to reflect this uncertainty.

Anticipated Project Modification and Costs:

- Total Section 7 Costs: $0 to $200,000

Due to the small footprints of communications facilities, it is likely that the facility will not adversely affect listed plant species. However, if a listed plant population or the *primary constituent elements* are found, the project may have to be modified. One modification would be to move the site far enough away from the plant population so that construction will not affect it. If the siting change is made early in the permit process, then the cost of moving the site could be negligible. However, if some or all of the permits have been obtained before the plant population is discovered, new permits may be required for the changed location. The cost of obtaining a Conservation District Use Permit can be between $25,000 and $100,000 (based on information from planning consultants). While most of the existing communications facilities are not located in the Conservation District, this analysis conservatively accounts for the possibility that a future communications facility may be proposed within the Conservation District.

- Costs Attributable to Critical Habitat: $0 to $200,000

Because all consultation costs are conservatively attributed to critical habitat, the costs associated with any project modifications arising from these consultations are also attributed to critical habitat.

3.j Residential Development

3.j(1) Potential Development Within the Agricultural District

Land in the Agricultural District is generally used for crops, livestock, and grazing as well as for accessory structures and farmhouses. Land in the Agricultural District is not meant to be urbanized, although, in practice, it is sometimes used for large-lot subdivisions. In addition, the probability of the State redistricting land for urban uses is higher for land in the Agricultural District than land in the Conservation District.

As noted earlier, approximately 29,175 acres of land of the proposed critical habitat are within the State Agricultural District and much of this land is in active use for farming or grazing. Based on the location of existing infrastructure and development and on limited access to water, most of this land is not in the path of potential development over the next ten years.

However, despite its remote location and lack of infrastructure, one area within proposed Unit H and the Agricultural District, Kahikinui, is leased to beneficiaries for homestead use. The costs associated with development at Kahikinui are included earlier in Section 3.d. The only other Agricultural land that appears in the path of possible development within the next ten years is Agricultural land in Units A, B2, C3 and C4 due to its proximity to existing developments; however, there are no immediate plans for development of this property and there is no known *Federal nexus* for any such development that might occur.

3.j(2) Direct Economic Impacts of Potential Development Within the Agricultural District

Potential Project or Activity, Next Ten Years: Residential development

*Federal Involvemen*t: None known

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because no plans exist for residential development in the Agricultural District that overlaps with proposed critical habitat units and there is no anticipated *Federal involvement.*

3.k. Water

3.k(1) Water Systems

As indicated in Table I-1, components of water systems are located in Units A, B1, B2, C4, D1, H, I4, J, and L. The East Maui Irrigation Company (EMI), Maui Land and Pineapple Co., and the Maui County Department of Water Supply all own water infrastructure that is located within the proposed critical habitat, including diversions, tunnels, pipelines, wells, aqueducts, and ditches. In addition, gaging stations utilized for research purposes by the United States Geological Survey (USGS) are also located within the proposed critical habitat. In addition, parts of private trails and access roads that are used to maintain the existing water systems are within the proposed critical habitat.

Water improvements require periodic maintenance to insure that pumps continue to run, leaks are detected and repaired, vegetation is cleared from ditch systems, etc. These actions focus on repair and maintenance, and such O&M of existing man-made features and structures is not subject to section 7 consultation.

Watershed protection activities, such as fencing, ungulate control, and alien species removal, are planned within the proposed critical habitat, in conjunction with the West Maui Mountains Watershed Partnership and/or the East Maui Watershed Partnership. Costs associated with consultation for these activities have already been included in this analysis in Section 3.f.

Most of the water projects for the Maui County Department of Water Supply are in the more populated areas. However, while there are no immediate plans for new water infrastructure within the proposed critical habitat, it is possible that construction of new large raw water storage reservoirs or new wells, and accompanying transmission infrastructure, could be proposed in the proposed critical habitat within the next ten years. The Department would likely seek State or Federal funding for these improvements.

3.k(2) Direct Economic Impact on Water Systems

Potential Project or Activity, Next Ten Years: Construction of water infrastructure, such as water storage reservoir or new wells and accompanying transmission structures

Federal Involvement: Possible Federal funding

Presence of Other Listed Species: Possible, depending on location of facilities

Other Land Management: Depends on location, but likely to be within State Conservation District

Consultation Costs:

- Total Section 7 Costs: $0 to $68,000

Estimate based on (1) zero to two consultations in the next ten years, (2) Medium to High cost from Table VI-1 of a consultation with a Federal agency as the applicant and the involvement of a non-Federal agency, and (3) the cost of a biological survey, based on a ten-acre open or forested site with medium to difficult access. The number of consultations is presented as a range to account for projects possible within the next ten years, but that are not immediately planned. While other listed species may be present, the entire cost of the consultation is conservatively assigned to the plants, even though the consultation may also address the other listed species.

- Costs Attributable to Critical Habitat: $0 to $26,400

Because the construction of new water infrastructure is possible rather than definitely planned, the location for such infrastructure is unknown. However, various listed species are known to occur in the watershed, and it is likely that the consultation would have occurred even without the proposed critical habitat designation. However, the designation of critical habitat would expand the area requiring consultation and could increase the complexity of the consultation. Absent critical habitat, it is estimated that the consultation would involve Medium cost, but still involve the same biological survey ($0 to $41,600). Thus, the difference in cost is attributable to the critical habitat.

Anticipated Project Modification and Costs:

- Total Section 7 Costs: $0 to $200,000

Due to the large footprint of a water storage reservoir, it is possible to adversely affect either the listed plant species or the critical habitat, thus requiring project modifications. One modification would be to move the site to a less sensitive area or to an area without the *primary constituent elements*. If the siting change is made early in the permit process, then the cost of moving the site could be negligible. However, if some or all of the permits have been obtained before the plant population is discovered, new permits may be required for the changed location. The cost of obtaining a Conservation District Use Permit can be between $25,000 and $100,000 (based on information from planning consultants).

- Costs Attributable to Critical Habitat: $0 to $200,000

In general, adverse impacts on listed plant populations are more easily avoided than adverse impacts on critical habitat because more information is known about existing plant populations than is known about the specific quality of the habitat at a particular location. As such, costs associated with project modifications are more likely to arise from impacts on critical habitat than from impacts on listed plant populations. Thus, all of the costs associated with project modifications are conservatively attributed to critical habitat.

3.l. Military Activities

3.l.(1) Hawai‘i Army National Guard

The Hawai‘i Army National Guard manages the Kanaio Training Area, on State land within Proposed Unit H. For about the past five years, the Guard's primary activities in this area involve environmental preservation, including the construction of fencing around botanically sensitive areas. Conservation and preservation activities were designed in close cooperation with the Service and, at the moment, the Guard plans no new projects.

The Guard is seeking an Executive Order from the Governor to transfer the land from DLNR to the National Guard. Once this occurs, the Guard intends to begin training exercises in the area. These exercises could include air-mobile (i.e. helicopter) operations, insertion and maneuver training, and land navigation and scouting procedures with company-sized units, but no live-fire training.

The Kanaio Training Area includes a number of sensitive areas, including cultural sites and the habitat for listed plants. The Guard uses these sensitive areas to enhance training by treating them as locations to be avoided. Ultimately, the Guard would like its operations to be a working model of combining preservation and training.

3.l.(2) Direct Economic Impact on Hawai‘i Army National Guard

Potential Project or Activity, Next Ten Years: Institution of military training exercises

Federal Involvement: Federal funding

Presence of Other Listed Species: Possible, depending on location

Consultation Costs:

- Total Section 7 Costs: $15,700

Estimate based on (1) one consultation in the next ten years, (2) Medium cost from Table VI-1 of a consultation with a Federal agency as the applicant and the involvement of a non-Federal agency, and (3) no biological survey. No new biological survey is anticipated due to the existence of previous surveys and prior Service familiarity with the area. While other listed species may be present, the entire cost of the consultation is conservatively assigned to the plants, even though the consultation may also address the other listed species.

- Costs Attributable to Critical Habitat: $10,500

Due to the Federal funding received by the Hawai'i Army National Guard and the presence of listed plants, the Guard has regularly consulted in the past with the Service on proposed activities in the Kanaio Training Area and has indicated that it intends to continue to do so in the future, even in the absence of critical habitat designation. Based on the past familiarity of the Service with the site, it is estimated that absent critical habitat designation, the consultation would involve Low cost from Table VI-1. With critical habitat designation, it is estimated that the consultation would involve Medium cost from Table VI-1 as an additional amount of effort would be required to evaluate the impact on areas not considered *occupied* by a listed species. Thus, the amount attributable to critical habitat is the difference, or $10,500.

Anticipated Project Modification and Costs: Minor

As noted earlier in this Chapter, the Hawai'i Army National Guard initiated informal consultation in October 1996 regarding the effects of training activities such as land navigation maneuvers, live fire and subcaliber target practice. The Service required minor project modifications, including strict enforcement of rules against smoking while training, a prohibition on fires and the use of signal flares, and a requirement for cleaning and visual inspection of vehicles, boots, clothing, gear and equipment prior to entry into the area.

In addition, the Guard has worked closely with the Service on the development of a Natural Resources Management Plan for the area, which includes specific conservation activities to protect listed species and important habitat. Because any new training activities are likely to be planned with the input of the Service and in conformance with the existing Natural Resources Management Plan, project modifications are anticipated to be minor.

3.l.(3) United States Military

Maui hosts no U.S. military facility within the proposed critical habitat and no new military activities have been announced as planned for Maui.[13] Therefore, no military activity is anticipated to occur on Maui within the proposed critical habitat in the next ten years.

Federal Involvement: U.S. Military

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because no known plans exist for new military activities on Maui within the proposed critical habitat units.

3.m. Roads

A few paved roadways are located within the proposed critical habitat units (see Table I-1). No widening or major improvements appear to be planned within the next ten years for the portions

[13] The Maui Space Surveillance Site, located atop Haleakala, is within HAOS, considered by the Service to be an "unmapped hole," as discussed in Chapter I, Section 2.b.

of roads which fall within the proposed critical habitat. Information from the National Park Service (NPS) indicates that no widening or major improvements are planned for the roads contained within proposed critical habitat Unit I1 or J, and information from State DOT and the Maui County Department of Public Works, Highways Division, indicates that no widening or major improvements are planned for the portions of the road in Units C3, G3, H, I1 or I3.

Potential Project or Activity, Next ten Years: None anticipated

Anticipated Costs of Consultation and Project Modification: None

No consultations or project modifications are anticipated because no roadway projects are planned in the next ten years in the proposed critical habitat.

3.n. Ecotourism

Commercial hiking tours and horseback riding, led by professional naturalist guides and featuring Hawai'i's unique ecosystems and endemic plants, are offered on Maui. As shown in Table I-1, the proposed critical habitat designation contains multiple hiking trails. Many of the areas proposed for critical habitat designation are areas of significant natural beauty and cultural value, qualities that also make these areas attractive for ecotourism.

Potential Project or Activity, Next Ten Years: Commercial hiking and horseback riding

Federal Involvement: None

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because the activity does not have *Federal involvement*.

3.0. Natural Disasters

The most likely natural disasters to affect proposed critical habitat would be a major hurricane passing over Maui, a *tsunami*, or wildfire. While Maui has not been directly hit by a hurricane in the past 50 years, it remains a possibility. In the mountainous regions proposed for critical habitat, wind and water damage caused by a major hurricane could include downed trees and branches as well as washed out roads, trails, and irrigation ditch systems. While little *tsunami* activity has occurred in the past 30 years, *tsunamis* have caused more deaths than any other natural disaster in Hawai‘i. A *tsunami* hitting the Maui coast could cause significant damage to the shoreline and to plant life. Maui has experienced dangerous wildfires in the past, with a January 2001 wildfire causing closure of the Honoapi‘ilani Highway. Recovering from any of these natural disasters could involve clearing away downed trees, branches, and other debris, and rebuilding damaged structures

Potential Project or Activity, Next Ten Years: Possible recovery from a natural disaster

Federal Involvement: Financial assistance from the Federal Emergency Management Agency (FEMA)

Consultation and Costs:

In the event of a natural disaster, a consultation with the Service would be required if financial assistance is sought from FEMA to help residents, businesses or the government recover from the occasional natural disaster in areas where there are listed species and/or critical habitat. In such emergencies, the Service expedites consultations.

- Total Section 7 Costs: $4,000 to $7,500

Estimate is based on five to ten days of effort by Service biologists to review the proposed projects at approximately $750 per day. While other listed species may be present, all costs of the consultation are assigned to the plants even though the consultation may also address the other listed species.

- Cost Attributable to Critical Habitat: $4,000 to $7,500

FEMA has not consulted with the Service in the past on funding for recovery from natural disasters on Kaua'i (Hurricane Iniki), so it is likely that the costs of any future consultations would be attributable to critical habitat.

Anticipated Project Modifications and Costs: Minor

As long as recovery projects are planned so that they avoid further damage to forests and streams—which is likely to be the case—the proposed plants critical habitat designation would have little or no economic impact on FEMA projects following a natural disaster.

4. INDIRECT COSTS

4.a Introduction

Aside from the protection provided by the Act as described in Chapter III, the Act does not provide other forms of protection to lands designated as critical habitat. Because consultation under section 7 only applies to activities that have *Federal involvement*, the designation of critical habitat does not afford any additional protections for listed species with respect to strictly private activities.

However, designation of critical habitat may have indirect impacts beyond those associated with the Act. For example, designation may provide the impetus for the State and counties to

require additional protections for designated critical habitat that would not otherwise be subject to such protections. These protections may affect both the management of affected lands as well as State and county development approvals. Also, the critical habitat designations may affect property values. While there is uncertainty on whether any or all of these indirect impacts may actually occur, possible indirect impacts of the proposed designation are addressed below.

4.b Management of Game Mammals and Loss of Hunting Lands

4.b.(1) The Game-Management Issue

One of the major issues surrounding the proposed critical habitat designations concerns the management of game-mammal populations (i.e., feral pigs, goats and deer) and the potential loss of valued hunting lands. This is a highly sensitive issue throughout the State that for decades has been debated among environmental groups, hunters, biologists and government agencies. The concern does not extend to game birds, however, since the Service currently believes that these birds and the hunting of them do not have a significant adverse impact on listed species or their habitats.

As discussed in the proposed rule, the major threat to the survival and conservation of Hawai‘i’s native plants comes from ungulates, combined with competition from non-native plants. Ungulates feed on the succulent seedlings, stems and roots of various native plants; trample native groundcover and uproot seedlings and other low-growing plants; and create openings and sites where invasive non-native plants can become established and spread. Finally, ungulates carry seeds of non-native weedy and invasive plants in and on their bodies, thereby distributing invasive plants to new areas, especially along trails, in and around wallows, and in areas that have been rooted up or grazed. Many invasive non-native plants are able to colonize newly disturbed areas more quickly and effectively than can the native plants.

As discussed in the proposed rule, the Service believes conservation goals for endangered Hawaiian plant species cannot be achieved when feral ungulates are present in “essential habitat areas.” Ranked in order of importance, the first of 13 recommended management actions needed to assure the survival and conservation of Hawai‘i’s endangered plants is “feral ungulate control.” Consistent with this finding, the Service opposes land management that allows or enhances the free ranging of large populations of feral ungulates in areas having vulnerable plant species.

Measures to control feral ungulates in protected areas typically include strategic fencing, or barrier fencing, to prevent or limit their migration into designated areas; exclosure fencing to prevent ungulates from entering protected areas; organized hunting to remove them from protected areas; and monitoring ungulate activity so land managers can direct hunters to problem areas. If increased hunting pressure does not reduce feral ungulate activity, land managers may work with hunters to identify and implement alternative methods, which may include trapping in remote areas. All of these activities may reduce the number of game mammals available to hunters and the sizes of hunting areas.

Approximately four percent of the resident population of Maui is hunters. While many hunters accept the need to protect limited portions of the native forest from damage by ungulates, the majority of hunters strongly oppose removing game mammals from large portions of existing

hunting areas. Furthermore, many hunters fear that critical habitat designation will lead to a loss of prized hunting areas as was the case with the court-ordered eradication of sheep and goats from the *palila* critical habitat on the Island of Hawai'i 20 years ago (see Appendix VI-A). Instead, most hunters advocate that game-mammal populations continue to be sustained at levels that are sufficient to allow recreational and subsistence hunting in all but possibly a few of the existing State Hunting Units. They also see themselves as important contributors to controlling feral ungulate populations at reasonable levels and at little cost to the taxpayer.

Also, hunters have expressed concern that critical habitat designations could affect wildlife management projects proposed for Pittman-Robertson funding. The concern is reinforced by the perception that the Service, over the objections of DLNR and its subsequent appeal to the Service, withheld Pittman-Robertson funds for game-management projects in areas proposed for critical habitat designation. (See Appendix VI-A at the end of this chapter for more information on hunting in Hawai‘i.)

4.b.(2) Indirect Impacts on Game Management

Section 7(b)(2) of the Act by itself does not require DLNR to manage State hunting lands to protect critical habitat; assure the survival and conservation of listed species; or participate in projects to recover species for which critical habitat has been established. That is, critical habitat designation does not require (1) creating any reserve, refuge, or wilderness areas; (2) fencing for any reason; (3) removing ungulates; or (4) closing areas to hunters. Instead, it requires only that, if DLNR seeks to undertake an activity that may affect the designated area using Federal funding or with a Federal permit, the Federal action agency consult with the Service. Furthermore, DLNR can use Federal Pittman-Robertson funds to selectively fund game-management projects that do not affect critical habitat, thereby obviating the need for consultations on game management in these areas.

However, critical habitat designation would add weight to the argument that game-mammal populations should be eliminated or reduced substantially in affected areas because they threaten Hawai‘i’s native plants. In turn, DLNR may elect to change its game-management strategies to reflect this shift in priorities.

4.b.(3) Indirect Impacts on Hunting Conditioned on a Change in Game Management

Assuming, for the sake of illustration, that DLNR adopts a policy of reducing game-mammal populations substantially in the State Hunting Units that overlap critical habitat units, then the following impacts related to hunting could be expected.

Hunting Activity

Initially, the number of hunting trips into the more accessible critical habitat units would increase. But after the populations dropped to lower levels, the number of hunting trips into these units would probably drop also because of low success rates.

Some hunters might continue to hunt in critical habitat units for the wilderness experience, and some might switch to hunting game birds. But the most likely outcome is that most of them would switch to State Hunting Units outside the proposed critical habitat, increasing hunting pressures in these areas even more. And some hunters might choose to hunt less or not at all, spending their discretionary time and funds instead on other recreational pursuits. Finally, some hunters may switch to hunting on privately-managed hunting lands on Maui.

Economic Activity

To illustrate the magnitude of the impacts, if about half of those who hunt game mammals on the affected lands were to give up hunting, then hunting activity on Maui could drop by about 15 percent (half of 30 percent, which is the estimated percentage of the accessible State-managed hunting lands on Maui proposed for designation). This translates into an annual decrease in economic activity related to hunting on Maui of about $330,000 in direct sales (15 percent of $2.2 million); $630,000 in total direct and indirect sales (15 percent of $4.2 million); 12 jobs (15 percent of 77 jobs); and $270,000 in income (15 percent of $1.8 million). Total economic activity related to hunting on Maui is documented in Appendix VI-A.

For the most part, the $330,000 decrease in expenditures by the displaced hunters would probably be spent on other activities, goods and services. This would create economic activity that would offset the decrease in economic activity related to the reduced expenditures on hunting. Thus, the net economic impact would probably be small. However, there would be distributional impacts, with some providers of goods and services benefiting at the expense of the stores and service-providers catering to hunters.

Hunter Benefits

Although a reduction in hunting activity would probably result in a small net change in economic activity, it would result in a loss in value or benefit to hunters (consumers' surplus)—see Appendix VI-A for the total benefits related to hunting on Maui. Under the given assumptions, this annual loss is estimated at $129,000 (15 percent of the $860,000 in surplus value). But partially offsetting this loss to hunters would be benefits derived from activities that replace game-mammal hunting.

Pittman-Robertson Funding

In some states, a reduction in the number of licensed hunters could reduce the amount of Federal Pittman-Robertson funding the state receives. The reason for this is that the formula used to calculate the distribution of funds is based in part on the number of licensed hunters. However, Hawai‘i currently receives the minimum amount of funding in relation to the number of hunters.

Thus, any drop in the number of hunters would have no effect on the amount of funding Hawai‘i receives. Furthermore, if a Pittman-Robertson project is denied by the Service, or DLNR decides not to proceed with a proposed project, the associated Pittman-Robertson funds would not be lost. Instead, DLNR could use the funds to support another wildlife management project.

State Expenditures

Finally, DLNR would probably have to expend more funds to maintain low game-mammal populations in areas that no longer attract hunters because of low success rates, and to control non-native plants and weeds in degraded areas where large populations of game mammals no longer browse.

4.b.(4) Probability of a Change in Game Management

The above outcome would occur only if the State were to adopt a new policy to reduce game-mammal populations substantially in critical habitat units that overlap with State Hunting Units. However, a major change in State management of game mammals on Maui is not expected.

As mentioned above, the debate about the management of game-mammal populations is a highly divisive and contentious one that has been argued for many decades in Hawai‘i—a debate that long preceded the Maui plant species listings and the proposed critical habitat designations. Critical habitat designations would not change the nature of the debate significantly, but they would expand the geographic focus to include areas that were not considered in previous consultations because they do not support listed plant species.

But, even with the added weight of this argument, the probability is slight that the State would adopt a policy to substantially reduce game-mammal populations in critical habitat units that overlap with State Hunting Units. This judgment is based on discussions with DLNR, others familiar with the subject, and decades of public testimony by hunters. Simply put, the scenario is not regarded as politically realistic: hunters would vigorously oppose a proposed reduction in game populations.

In addition to the political problem, there are concerns within DLNR about the cost and feasibility of the removal of large numbers of game mammals from about 32,000 acres dispersed among critical habitat units. The most costly item would be removing ungulates from inaccessible areas and the stragglers remaining after hunters lose interest when their success rates drop. DLNR could utilize helicopters at this stage to hunt game, but this is expensive and ineffective in forested areas. Also, snares could be used to trap animals, but DLNR believes that checking them daily is costly; they pose risks to hunting dogs; they are regarded as inhumane; and they evoke complaints from the public.

Once the game mammal populations are reduced, there are additional concerns within DLNR about the cost of maintaining low populations—particularly if hunters are not interested in hunting in an area due to low success rates or difficult access. And where strategic fencing is in place, there are concerns about the periodic cost of repairing or replacing sections of fencing that have been vandalized.

4.b.(5) Net Economic Impact

In summary, the probability of a major change in game management in Hawai‘i is regarded as slight, even though the proposed critical habitat designation would add weight to the argument that game-mammal populations should be reduced substantially in affected areas. Thus, designation of critical habitat is expected to have minor economic impacts related to management of game mammals and to hunting.

4.c. Conservation Management

Private and public landowners have expressed concern that they will be required to alter the management of their lands that fall within the designation so as to assure the survival and conservation of listed species, regardless of whether they plan to propose any changes to land uses or activities in the future. This concern stems in part from language in the proposed rule identifying overgrazing, the maintenance of feral ungulate levels, excess groundwater pumping, manipulation of vegetation, and the grazing of livestock or horses as activities that may directly or indirectly destroy or adversely modify critical habitat. (67 FR 15954). Specifically, some landowners are concerned that critical habitat designation could (1) require an end to grazing or farming in critical habitat or (2) reduce or restrict the ability to draw water from existing water diversions on streams located within the proposed critical habitat.

Landowners have also expressed concern that, in addition to putting a halt to existing activities, critical habitat designation could result in the imposition of new management obligations, such as the construction of fencing, the removal of feral ungulates, or the removal of noxious weeds. Some landowners have expressed concern that this new obligation will be expensive and they will have to pay most or all of any costs that may be associated with managing the land to assure survival and conservation of the species.

Finally, some landowners have expressed concern over the possible loss of discretion over their land management practices. Specifically, there is concern that beneficial land management practices voluntarily adopted in the past may become mandatory without regard to either the economic impact, the actual benefits associated with the practice, or the role of these management practices in their ongoing operations.

Discussed below are the existing and potential obligations under the Act associated with this type of land management, management activities that would enhance the survival and conservation of listed plants, and the estimated costs of such management activities.

4.c.(1) Requirements for Conservation Land Management

Existing Federal Requirements

Section 7 of the Act by itself does not require landowners to manage their lands to protect critical habitat, assure the survival and conservation of listed species, or participate in projects to recover species for which critical habitat has been established. That is, critical habitat designation,

by itself, does not require any landowner to: (1) create any reserve, refuge, or wilderness areas; (2) fence for any reason; (3) remove ungulates, rodents, or weeds; (4) close areas to hunters or hikers; (5) initiate conservation projects; or (6) prepare special land-management plans.

Instead, it requires only that a Federal agency that provides funding or permits for any activity that may affect the designated area must consult with the Service to insure that the activity is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species.

Existing State Requirements

Under existing State law, a Federal designation of critical habitat does not subject the land to additional State requirements to proactively manage the land to conserve listed species. In fact, Hawai'i[11]s endangered species law (HRS §§195D), does not mention "critical habitat" although it does mention "habitat."

Potential Future Requirements

Even though there is no direct requirement under Federal or State law to proactively manage lands to protect listed species and their habitats, some landowners speculate that, pursuant to litigation, a Federal or State court could mandate the cessation of existing activities and the institution of conservation management on privately owned critical habitat. Specifically, landowners fear the success of an argument similar to that used successfully in Federal Court to order the eradication of sheep and goats on Mauna Kea to protect the critical habitat of the endangered *palila* bird. (*Palila vs. Hawaii Department of Land and Natural Resources*). The *Palila* case was based upon section 9(a)(1) of the Act and found that modifying critical habitat could amount to a *take* of the species.

Potential Future Requirements: Endangered Species Act

Under Federal law, the prohibition on *taking* in the Act applies to fish and wildlife, but not to plants. Thus, it is arguable that the *Palila* decision is inapplicable to listed plants because that decision specifically addressed the Service's interpretation of the word *harm*, which is listed as a prohibited activity under the definition of *take.*

Still, an argument could be made that the reasoning underlying the *Palila* decision also applies to section 9(a)(2). Section 9(a)(2) of the Act makes it unlawful to "remove, cut, dig up, or damage or destroy any such (listed plant) species on any [land outside Federal jurisdiction] in knowing violation of any law or regulation of any State or in the course of any violation of a State criminal trespass law." Despite the presence of State law in Hawai‘i protecting endangered or threatened plants, the prohibitions in section 9(a)(2) (against removing, cutting, digging up, damaging or destroying listed plants) are arguably narrower than the broader concept of *take* that was at issue in the *Palila* case. In addition to being limited to the removal, cutting, digging up, damage and destruction of a listed plant, a violation of section 9(a)(2) requires knowledge that the particular action violates State law. While a court could interpret this section broadly to prevent modification to critical habitat or require institution of conservation management activities, it is difficult to imagine a situation where an activity removes, cuts, digs up, damages or destroys a listed

species in an area where the species is not present (i.e. an *unoccupied* area). Thus, the likelihood of this result is estimated to be low for purposes of this economic analysis.

In addition, it should be noted that an attempt to require conservation management in a particular area through litigation based on section 9(a)(2) could be brought with or without the designation of critical habitat. While any conservation management practices required as a result of such litigation would be section 9 costs, rather than section 7 costs, the practical effect of critical habitat designation could be to expand and define more precisely the geographic extent of habitat that could be the subject of such a court decision.

Potential Future Requirements: Interplay with State Law

Landowners also fear that conservation management may be imposed based on the interplay between provisions of State law and the designation of critical habitat. Under State law, the *taking* of any native threatened or endangered plant is prohibited. Landowners fear application of the Federal definition of *take*, as applied in the *Palila* case, to the State Act. Moreover, because there is no critical habitat under State law, landowners fear that Federal designation of critical habitat would create the opportunity for this argument to be made under State law. In short, landowners fear that a court could find that an action that degrades Federal critical habitat constitutes an illegal *taking* under State law. For example, allowing ungulates, including cattle, to roam free could be viewed as an activity that degrades a critical habitat and therefore amounts to a *taking* under State law of a listed species.

However, the State law prohibiting the *taking* of endangered or threatened plants is narrower than the Federal *take* provision. Specifically, State law defines *take* as "to cut, collect, uproot, destroy, injure or possess endangered or threatened species of aquatic life of land plants." The word *harm*, upon which the *Palila* case relied, is not included in the State definition of *take* for plants.

Based on the above, while an argument is possible that the interplay between the designation of critical habitat and State law could mandate conservation management, the likelihood of this result is estimated to be low for purposes of this economic analysis.

4.c.(2) Conservation Management to Protect Listed Plants

As indicated in the proposed rule, the major threats to native plants come from ungulates, combined with competition from non-native plants. In response to these and other threats, management actions needed to assure the survival and conservation of Hawai‘i's listed species include: (1) feral ungulate control (e.g., strategic or barrier fencing to prevent or limit ungulates from migrating into large protected areas, exclosure fencing to prevent them from entering an area, extensive hunting and trapping to remove them from protected areas, one-way gates that allow animals to leave but not to enter an area, and monitoring transects for the presence of ungulates); (2) non-native plant control; (3) rodent control; (4) invertebrate pest control; (5) fire management; (6) maintenance of genetic material of the endangered and threatened plant species; (7) propagation, reintroduction and/or augmentation of existing populations into areas deemed essential for the conservation of species; (8) ongoing management of the wild, outplanted and augmented populations; and (9) habitat management and restoration in areas deemed essential for the conservation of species.

4.c.(3) Costs of Conservation Management Activities

The cost of implementing the above management actions would depend on the circumstances: the size of the area being managed, its location and access, the terrain, the quality of the native vegetation, ungulate populations, the extent of weeds, the risk of fire, land-management goals, etc. In addition, the costs arising from the halting of any existing activities would depend upon the nature of the activity, the availability of alternative locations to conduct the activity, and the cost of relocation.

For large mountainous areas such as watersheds, the greatest costs typically are incurred in the early years, with the most expensive items being fencing and removing ungulates. Depending upon location and terrain, the cost of fencing, including materials and installation, ranges from less than $30,000 per mile for areas that are accessible via a short drive, to as much as $170,000 per mile for remote locations that must be reached by helicopter (based on information from DLNR and NPS).

Depending upon the circumstances, annual conservation-management costs range from an average of less than $30 per acre to more than $80 per acre (based on information from DLNR, NPS, and private organizations). These figures are based on managing large, contiguous areas in the mountains; per-acre costs for managing small, dispersed areas could be significantly higher.

In addition to land-management costs, conservation of endangered plants (i.e., propagation, reintroduction and/or augmentation, fencing to protect from ungulates, monitoring, etc.) can be expensive. For example, a five-year effort to plant 25,000 silversword on Mauna Loa and Mauna Kea on the Big Island, which is regarded as being relatively straightforward and does not require weed control, is estimated at $1 million (estimate provided by DLNR, 2001).

Government cost-sharing programs are available to fund conservation projects (see Chapter IV), but current funding is inadequate to support such projects for all the lands in Hawai‘i that are being proposed for critical habitat.

4.c.(4) Potential Cost of Conservation Land-Management Due to Critical Habitat

While the probability of a court mandating the institution of conservation management practices or the cessation of existing practices within critical habitat is estimated to be low, for the purposes of illustration of the potential costs involved, this section will assume that conservation management is mandated. For these purposes, the analysis will also assume that the conservation management is mandated for all of the proposed critical habitat that is in the mountains of Maui – approximately 123,000 acres (97 percent) of the proposed critical habitat – since valuable natural resources such as watersheds and rare species tend to be concentrated in those areas.

Under such a circumstance, the critical habitat proposal could cost landowners on Maui $3.7 million to $9.8 million per year to manage these areas (based on $30 to $80 per acre). Based on land ownership of these areas, about $666,000 to $1.8 million per year would be a Federal obligation($3.7 million*18%; $9.8 million*18%), about $1.7 million to $4.4 million per year would be a State obligation ($3.7 million*45%; $9.8 million*45%), and about $1.4 million to $3.6 million per year would be an obligation of private landowners ($3.7 million*37%; $9.8 million*37%). Importantly, to varying degrees, some of these lands are already managed as part of the National Park System, as NARs or as part of the Natural Areas Partnership program, or as part of a Watershed Partnership (see Table I-1 and Chapter IV) and therefore these estimates likely overstate actual

management costs. The related increase in economic activity is discussed in the section on benefits (Section 6).

4.c.(4)(A) Mandated Removal of Ungulates

As noted previously, it is unlikely that conservation management measures will be required. However, If the required conservation management were to include removing ungulates, an additional loss could include the economic activity and benefits related to hunting. As discussed earlier, this loss would amount to about $630,000 per year in direct and indirect sales, and $129,000 per year in benefits to hunters. However, any loss in economic activity and benefits would be largely offset by hunters spending on other activities that replace hunting.

4.c.(4)(B) Mandated Cessation of Existing Agricultural Activities

As noted previously, it is unlikely that conservation management measures will be required. However, if the required conservation management were to include cessation of existing ranching or farming activities, an additional loss could include the economic activity related to ranching and farming. Of the 13,300 acres of proposed critical habitat on privately-owned land in the Agricultural District, approximately 11,000 acres (83 percent) are used as pasture. In general, cattle grazing is a low-value use of land. The carrying capacity of grazing land can vary depending upon soil, rainfall, terrain, and the resulting availability of grass. While most grazing operations in Hawai‘i are marginally profitable, a large amount of land is used for grazing cattle because (1) the animals help control weeds, reducing fire hazards; (2) the agricultural use of the land lowers property taxes because the land is assessed at its low agricultural value rather than its higher market value; (3) many ranchers are drawn to the lifestyle.

Maui hosts approximately 800 farms on 290,000 acres, of which at least 52,000 acres are dedicated to crop production (Hawai‘i State Data Book, 2000). Assuming that the remaining land is used entirely for grazing, then 238,000 acres would be available. However, the total farm acreage (290,000) includes land that is not used for crops or pasture, such as farmhouse lots, roads, woodlots, etc. (Statistics of Hawai‘i Agriculture, 2000). Conservatively assuming that 50 to 90 percent is used in grazing would mean that between 119,000 and 214,000 acres are used for grazing. The 11,000 privately-owned acres used for grazing would then constitute between five and nine percent of the grazing land on Maui (11,000/214,000; 11,000/119,000). Overall cattle sales for Maui in 2000 generated $3,230,000; five percent of the total is $161,500 and nine percent of the total is $290,700. Thus, one estimate of the revenues derived from ranching within the proposed critical habitat is $161,500 to $290,700.

A second method to evaluate the per-acre loss in economic activity that could occur if grazing were not allowed on proposed critical habitat units is to review the land rents generated by grazing. In general, grazing is a low-value, marginally profitable activity that typically generates land rents of less than $10 per acre per year (based on information from landowners and ranchers). Based on an estimate of approximately 11,000 acres of the designation being used for ranching, the annual cost of restricting grazing on Maui as a result of critical habitat is approximately $110,000 (11,000 acres * $10 per acre per year).

Companies that supply goods and services to ranches and the employees of these ranches in turn purchase goods and services from other companies, thereby generating even more output, and so on. This “indirect” output is scattered throughout the economy and the State. When both “direct” and “indirect” output are considered, total Statewide output associated with grazing 11,000 acres

of land amounts to between $173,000 to $456,000 per year, using multipliers for the cattle ranching industry from the Hawai'i Input-Output Model. This economic activity also supports between seven and 17 jobs.

Assuming the remaining 2,300 privately-owned Agricultural acres are devoted to diversified agriculture or pineapple, the economic impact associated with the cessation of farming activities due to mandated conservation would be as follows. Depending on the crop, annual revenues from diversified agriculture and pineapple can range from $1,500 per acre to over $10,000 per acre (based on information from the Hawai'i State Data Book, 2000). If the 2,300 acres were planted in diversified crops, they could generate annual revenues of between $3.5 million to $23 million. However, whether the 2,300 acres in the proposed critical habitat are or are not planted in diversified crops makes little difference to the growth of diversified agriculture, because the limiting factor to the growth of the industry is the market for profitable crops and not the land supply – a situation that reflects the abundance of good farm land in Hawai'i due to the contraction of plantation agriculture.

4.c.(4)(C) Mandated Cessation of Existing Water Diversions

As noted previously, it is unlikely that conservation management measures will be required. However, if required conservation management were to include the reduction or prohibition on existing water diversions from streams within the proposed critical habitat, an additional loss would be anticipated that would include impacts on farming activities, resort operations, and residential developments that utilize water from the existing diversions. Because of the broad-reaching nature of the impact, it is impossible to formulate an accurate estimate of the loss of all or a significant amount of the diverted water involved beyond acknowledging that it would be quite high, especially in light of the limited availability of other water sources. However, the likelihood of changes to the existing water diversions based on critical habitat is very low. First, the existing infrastructure constitutes existing man-made features that are found within the boundaries of critical habitat units but are not considered by the Service to be part of the proposed critical habitat (see Chapter I, Section 2.b). Second, none of the listed plants are aquatic species that would be impacted by water diversions (E-Mail Correspondence from Paul Henson, FWS, to Randy Bartlett, MLP, June 20, 2002).

4.c.(5) Conclusion

Private and public landowners have expressed concern that they will be required to alter the management of their lands that fall within the designation so as to assure the survival and conservation of listed species. While the costs associated with mandated conservation management, including the cessation of existing activities, are included in this analysis for purposes of illustrating the potential costs involved, the probability of this consequence is deemed to be low. In addition, if conservation management were to be mandated, it is more likely that these costs would be attributable to section 9 of the Act rather than to critical habitat designation.

4.d. Subsistence and Native Hawaiian Traditional and Cultural Practices

Another concern expressed is the effect of critical habitat designation on Native Hawaiian traditional and cultural practices, including subsistence activities. Specifically, there is concern that designation of critical habitat may interfere with or restrict the practice of subsistence and other traditional and cultural practices.

4.d.(1) Subsistence and Native Hawaiian Rights

The Hawai‘i State Constitution, Chapter 12, Section 7 reads:

> "The State reaffirms and shall protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupua‘a tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778 subject to right of the State to regulate such rights."

As indicated by this constitutional provision, subsistence and Native Hawaiian rights are closely tied. In early Native Hawaiian life, gathering activities supplemented the cultivated food and medicinal staples of the people, helped people survive in times of famine, and allowed tenants to retrieve large amounts of a product for a communal purpose, such as a tree for a canoe.

While Hawai‘i’s subsistence economy drastically changed with the changes in the land tenure system, Native Hawaiian traditional rights of access and gathering, for subsistence or other purposes, were not extinguished by the exclusivity traditionally associated with fee simple ownership of the land. (Kalipi v. Hawaiian Trust Co., 66 Haw. 1, 656 P.2d 745 (1982); Public Access Shoreline Hawai‘i (PASH) v. Hawai‘i County Planning Commission, 79 Haw. 425, 450 (1995), cert. denied, 517 U.S. 1163 (1996)). However, access is guaranteed only in connection with undeveloped lands, and while the Hawai‘i Supreme Court has ruled that the State Constitution does not prevent development by landowners, the point at which land becomes sufficiently developed to where it is inconsistent to allow or enforce the practice of traditional Hawaiian gathering rights on such property remains undecided. (PASH, 79 Haw. at 450).

Defined narrowly, subsistence consists of the non-commercial and non-recreational harvest of fish, game, marine mammals, plants and other products of the land for personal or communal use. The subsistence lifestyle also includes the processing of these products for food, clothing and other uses as well as sharing or exchanging these products with others in the community. Defined more broadly, subsistence includes a lifestyle choice. For some Native Hawaiians, subsistence is central to their culture and way of life.

4.d.(2) Practice of Subsistence on Maui

Studies of contemporary subsistence in Hawai‘i have documented subsistence practices and formulated conceptual plans for communities on Hawai‘i, Moloka‘i, Maui, and O‘ahu.

Subsistence can play an important role in community life, including:

- Providing families with essential resources that compensate for low income.
- Preserving traditional Hawaiian cultural values, customs and practices as cultural knowledge. Place names, fishing *ko‘a* (shrines), methods of fishing and gathering, and the reproductive cycles of marine and land resources have been passed down from one generation to the next through training in subsistence skills.
- Providing a link to the traditions and ways of life of previous generations – to the ways of the *kupuna* (elders) and the previous occupants of the land.

- Providing a basis for sharing and gift-giving within the community and reinforces good relations among members of extended families and neighbors.
- Allowing family members of all ages to contribute to family welfare.
- Fostering conservation because traditional subsistence practitioners are governed by particular codes of conduct intended to ensure the future availability of natural resources.
- Providing a valuable, but relatively inexpensive, form of exercise and stress reduction.
- Increasing the time spent in nature, cultivating a strong sense of environmental kinship.

(Molokaʻi Subsistence Task Force: Final Report 1994).

Preserving the practice of subsistence is of particular importance in Kahikinui, in proposed Unit H, and on Kahoʻolawe, in proposed Unit Ka A. The Kahikinui Community Based Economic Development and Makai Management Plan (2000) reflects the importance of subsistence opportunities, noting that the residents predominantly use the natural resources in the *moku*[14] of Kahikinui for subsistence purposes. The plan explicitly provides that "subsistence uses are valued above all other uses of the resources." Similarly, the Kahoʻolawe Use Plan (1995) explicitly values the continued practice of subsistence activities, stating that "in modern Hawaiʻi, Kahoʻolawe serves as the foundation for the revitalization of Hawaiian cultural, religious, and subsistence practices." Anticipated future subsistence activities include fishing, hunting, ocean gathering, and forest and stream gathering.

4.d.(3) Impact on Subsistence and Native Hawaiian Traditional and Cultural Activities

As noted earlier in Section 4.c, an undetermined probability exists that a Federal or State court could mandate conservation management of critical habitat based on the interplay between the Act and State requirements, which could involve activities such as fencing or ungulate removal that might reduce the ability of Native Hawaiians to practice subsistence activities in these areas. In addition, the State or private landowners could adopt a policy of restricting access into areas that overlap critical habitat units without a judicial mandate. The resulting economic impact under either scenario is difficult to estimate, as discussed below.[15]

The total economic value of subsistence is the total amount that subsistence participants and others would be willing to pay to engage in subsistence activities independent of whether they actually pay that amount. While it is possible to measure this total value for recreational activities

[14] *Moku* is a Hawaiian word referring to a large land division encompassing one or more *ahupuaʻa* (a division extending from the uplands to the sea). Handy, Handy & Pukui, 1972, Native Planters.

[15] This analysis borrows from *Economic Assessment of Bristol Bay Area National Wildlife Refuges: Alaska Peninsula/Becharof Izembek Togiak Final Draft*, prepared by the Institute of Social and Economic Research and Industrial Economics, Incorporated, for the Service in December 1998.

like fishing, the discussion below describes why typical methods of estimating economic value do not work when applied to subsistence.

One method for measuring willingness to pay, contingent valuation, is based on asking people how much they would be willing to pay to engage in subsistence, or how much they would need to be compensated to stop engaging in subsistence. To Native Hawaiians who consider subsistence to be a right or way of life, such questions have no meaning. In addition, some Native Hawaiians involved in the subsistence lifestyle on Maui have modest incomes and may be considered economically disadvantaged compared to other groups when responding to questions involving relative values based on monetary income.

The other commonly used method, known as travel cost, would estimate the value of subsistence by observing how often people visit sites at different distances with different characteristics. The value of difference sites to subsistence participants may be estimated by observing how the number of visits to different sites declined as the distance to the site increased. In theory, this method could determine the net economic value of subsistence activities in specific locations and thus be used to value the use of proposed critical habitat for subsistence activities. The practical difficulties in conducting such a study make it virtually impossible to conduct, and no such studies have ever been done.

One way to portray the importance of subsistence activities, a large share of which are for the collection and preparation of food, is by calculating the nutritional value of the products of the harvest. However, while it is known that food derived from subsistence activities makes up a portion of the diet of those practicing subsistence, the number of families practicing subsistence on Maui, the total nutritional value gained through subsistence, and the proportion of food derived from subsistence activities conducted in the proposed critical habitat (as opposed to outside the proposed critical habitat) is unknown.

Another way to portray the importance of subsistence activities is to use replacement cost to estimate its value. Replacement cost is defined as the market prices of the food and other commodities obtained through subsistence. The net value of subsistence would then be calculated by subtracting out the costs of engaging in subsistence. But replacement cost is an inappropriate measure of the total economic value of subsistence because it produces an underestimate of total economic value by not including the value associated with the activity of subsistence itself, independent of its product. For many different reasons, people engaged in subsistence value the experience independent of the harvest. For example, many people on Maui and Kahoʻolawe engaged in subsistence value the experience for the opportunity to share cultural knowledge with younger generations and for the connection with nature.

However, because replacement cost underestimates the total economic value of subsistence activities, it is best to avoid its use altogether. Not only is the underestimation likely to be considerable, but its use also validates and perpetuates the idea that the total value of subsistence lies in the market value of its products. In addition, there are practical difficulties in determining the replacement cost of many subsistence products, like *limu* or deer meat, that are not found in the grocery store.

However, the products of subsistence do represent income-in-kind to the residents of these communities. When measuring the economic well-being of residents of Maui, it is necessary to include not only money income, but also the monetary value for any goods or services that the residents receive, which is known as income-in-kind. Typical examples of income-in-kind are the

rental value of owner occupied housing and the value of products produced and consumed on family farms. Typically a value is placed on these goods and services based on observed prices in markets for these products. Estimation of this income-in-kind shows both the market value of the products harvested and the importance of these products as a source of income to the residents of Maui. For this calculation the use of replacement cost is appropriate. However, without information on the amount of subsistence harvest, it is impossible to provide estimates.

4.d.(5) Potential Subsistence-Related Costs Due to Critical Habitat

The value of subsistence activities to the residents of Maui is difficult to quantify because of the lack of information on the amount of the subsistence harvest. Further, the impact of a worst-case scenario that restricts access and prohibits subsistence activities in all areas proposed for critical habitat designation is complicated by the fact that subsistence activities may occur in areas outside the proposed critical habitat. The relative importance of the areas located within critical habitat versus those outside the proposed critical habitat is not documented. Presumably, a restriction in access would result in subsistence practitioners switching to locations outside the proposed critical habitat.

However, such a switch would have an impact. Clearly, subsistence fishing, ocean gathering, hunting, and forest and stream gathering, play an important role in the cultural and social framework of the community. The cultural aspect of subsistence does place value on the location where the activity is conducted. In addition, the areas within the proposed critical habitat used for subsistence activity may have greater importance than their size may indicate. For example, an area within the proposed critical habitat may be the only location on the island to collect a certain plant used for medicine. As such, there could be a significant, though undetermined, loss associated with restriction of subsistence activities in the proposed critical habitat.

However, the probability of the worst-case scenario, resulting in the restriction of access and prohibition of subsistence activities in all areas proposed for critical habitat designation is undetermined, but is generally unlikely. More likely to occur are restrictions in small, localized areas of significant biological importance. Because of the strong stewardship and conservation values associated with those practicing subsistence activities at Kahikinui and Kaho‘olawe and reflected in the management plans for both areas, as well as the recognition of the value of protecting certain area through the traditional *kapu* system, it is likely that subsistence activities would be consistent with conservation restrictions, particularly in localized areas. Thus, it is anticipated that the impact of critical habitat designation on subsistence activities will be minimal.

4.e. State Redistricting of Land

4.e.(1) Concerns about Redistricting

Another concern raised by private landowners is that once critical habitat is designated on their land, the State may redistrict it from the Agricultural District to the Conservation District. In turn, this will result in (1) a reduction in the value of the land; (2) lost current or potential agricultural use of the land; (3) higher property taxes because Conservation land can be assessed at a higher value than Agricultural land; and (4) reduced ability to secure bank financing.

Even if land is not redistricted, the State may seek agreements with landowners to protect the habitats of listed species as an incentive to retain their existing District designation. Based on the last boundary review, this could involve agreements to reforest lands using native species, or to

not subdivide or develop land that is habitat for listed species. Such requirements restrict future land use, thereby lowering property values. Some of these requirements may involve direct costs to the landowners, such as the cost of reforestation, while others involve indirect costs, as the loss of property value through restrictions on future land use.

These concerns, as they relate to Maui, are discussed below.

4.e.(2) Affected Lands

On Maui, about 13,300 acres of privately owned land in the Agricultural District are proposed for critical habitat. Affected areas include grazing land in Units E, H, I2, I3, I4, cropped land in parts of Units A, and D1, watershed protection areas in Units B2, D2, I1 and L, and grazing land adjacent to sea cliffs in Units C3, C4, G1, G4, and G5.

4.e.(3) Probability of Redistricting

The concern about potential redistricting of land designated as critical habitat stems from State statutes for Conservation of Aquatic Life, Wildlife and Land Plants (HRS, 195D) and the Land Use Commission (HRS, 205):

— Protection of Hawai'i's Unique Flora and Fauna (HRS 195D-5.1)

> DLNR "… shall initiate amendments to the Conservation District boundaries … in order to include high quality native forest and the habitat of rare native species of flora and fauna within the Conservation District."

— Districting and Classification of Lands (HRS 205-2(e))

> "Conservation Districts shall include areas for conserving indigenous or endemic plants, fish and wildlife, including those which are threatened or endangered."

— Land Use Commission Decision-making Criteria (HRS 205-17)

> "In its review of any petition for reclassification of district boundaries …, the commission shall specifically consider … the impact of the proposed reclassification on … (the) preservation or maintenance of important natural systems or habitats."

DBEDT's Office of Planning (OP) is responsible for conducting a periodic review of State District boundaries, referred to as the "boundary review." During the boundary review, OP considers whether the existing District boundaries are appropriate, taking into account current land uses, environmental concerns, and other factors. Critical habitat would prompt OP to consider redistricting from the Agricultural, Rural or Urban Districts to the Conservation District (DBEDT, Office of Planning).

However, such redistricting of privately owned land is likely to occur in only a limited number of cases. This assessment is based on the following:

— Critical habitat designation alone would not prompt the State to propose redistricting. A number of other factors would come into play, such as the

quality of the native habitat, the value of the land as watershed, slopes, etc. (DBEDT, Office of Planning).

— Approval of redistricting requires six affirmative votes from the nine commissioners, with the decision based on a "clear preponderance of the evidence that the proposed boundary is reasonable" (HRS 205-4).

— Private landowners strongly oppose proposals to redistrict their lands if they believe this might result in a decrease in property value and/or a loss in the economic use of their lands. Furthermore, they may file lawsuits claiming an unconstitutional taking of property.

— In the last State District boundary review, only four privately owned parcels were redistricted to Conservation.

4.e.(4) Cost of Contesting Redistricting

Even though the probability of redistricting private land to Conservation may be low, contesting a redistricting action can be time-consuming and costly for the landowner. Based on the last boundary review, some landowners report spending over $50,000.

4.e.(5) Reduction in Land Values Due to Redistricting

As noted above, redistricting of privately owned land is likely to occur in only a limited number of cases, if any. For purposes of illustration, however, this analysis estimates the potential costs if all privately owned land were to be redistricted. Reductions in land values due to redistricting land from the Agricultural District to Conservation could range from about $1,000 per acre for remote agricultural land (or less for gulch land) to $40,000 to $210,000 per acre for land suitable for large-lot residential development.

The range of values for land suitable for large-lot development ($40,000 to $210,000) was developed based upon a comparables analysis, utilizing information available in the Maui County Real Property Tax Assessments website to determine values for land in the Agricultural District near the proposed critical habitat that had already been improved for large-lot residential development.

For a particular parcel, the per-acre reduction in value resulting from redistricting would depend upon location, access, terrain, county plans and zoning, available infrastructure, development potential, etc. However, the lower value would apply to most of the privately-owned Agricultural land being proposed for critical habitat on Maui due to the remote location of most of the Agricultural lands, the nature of the terrain and the limited amount of water available to support development. Considering these factors, this analysis assumes that only 20 percent of the privately-owned Agricultural land is suitable for large-lot residential development in the future. While this estimate anticipates that such development would most likely occur in Units A, B2, D1, or I2, it should be noted that there are no publicly available plans for any such development and that this number is simply a general estimate.

A total reduction in value could be $117 million to $569 million (13,300 acres * 20% * $40,000 + 13,300 acres * 80% * $1000; 13,300 acres * 20% * $210,000 + 13,300 acres * 80% * $1,000). This represents a gross figure, and not a net reduction in value, as a landowner would have

to expend money, make improvements and receive development approvals before the existing property could be marketed as part of a large-lot residential subdivision.

Even if a landowner has no plans to sell the land, the loss in land value could reduce potential mortgage financing.

4.e.(6) Reduction in Agricultural Use of the Land

If land is redistricted to Conservation, agricultural activities could continue depending upon which subzone is assigned: typical agricultural activities are not allowed in the Protective Subzone, but are allowed in other subzones with permission of the State Board of Land and Natural Resources (BLNR).

4.e.(7) Changes in Property Taxes, Agricultural Land

Even though land values would decrease if Agricultural land were redistricted to Conservation, property taxes could remain the same, or they could increase or decrease. The change in taxes would depend on whether the land was dedicated to agriculture; if so, the land would be assessed at a low agricultural value rather than its higher market value. Because of a State policy to encourage agriculture, property taxes on land dedicated to agriculture are generally lower than they are with similar land in the Conservation District that is not used for agriculture. In other words, non-grazing land or non-farmed land in the Conservation District would not benefit from the State policy of assessing a lower agricultural value instead of market value.

For land in active agricultural use in the Agricultural District, an informal survey of TMK (Tax Map Key) records on Maui found assessed values on Maui ranging from $22 to $255 per acre. An informal survey of TMK records on Maui found assessed values for Conservation land ranging from $1 to $3,000 per acre, depending upon location. Conservation land is taxed at the same rate as Agricultural land, $4.93 per $1,000 of assessed value.

If land is in the Conservation District and actively used for agriculture, then the assessed value and the property taxes would be the same as for Agricultural land. Thus, if Agricultural land actively used for agriculture is redistricted to Conservation and agricultural use is allowed to continue, then property taxes would remain the same. In both cases, the land is assessed at its agricultural value and taxed at the rate of land in the Agricultural District.

But if Agricultural land in active agricultural use is redistricted to Conservation and the agricultural use is <u>not</u> allowed to continue, then property taxes may increase if the Conservation land value is higher than the assessed value of the land in active agricultural use. This could occur even though the actual market value of the land would be lower if it is redistricted to Conservation. This counter-intuitive result reflects the tax break the State gives to encourage agriculture.

If Agricultural land is not used for agriculture, then its assessed value is its estimated market value. In that case, redistricting to Conservation would result in a lower assessed value for the land and lower property taxes.

4.e.(8) Potential Redistricting-Related Costs Due to Critical Habitat

An undetermined probability exists that critical habitat designation could result in some privately-owned Agricultural land being proposed for redistricting to Conservation. If this were to

occur, then the affected landowner could spend more than $50,000 contesting the redistricting. Since this could involve approximately 18 private landowners on Maui, total costs could exceed $900,000.

Further, there is a small probability that critical habitat designation could in fact result in Agricultural land being redistricted to Conservation. If agricultural activities are not allowed, then the resulting economic loss would be as calculated earlier in Section 4.c.(4)(B), with a loss of revenue associated with grazing of between $110,000 to $290,700 and a loss of revenue associated with diversified agriculture of $3.5 million to $23 million. As discussed above in section 4.e.(3), however, redistricting of privately owned land is likely to occur in only a limited number of cases, if any. In addition, if agricultural activities are not allowed, increased property taxes are possible if the Conservation land value is greater than the assessed value of the land in active agricultural use. Finally, the total estimated gross reduction in property value due to redistricting would be approximately $117 million to $569 million, assuming that only 20 percent of the privately-owned Agricultural land is suitable for large-lot residential development in the future. Again, however, redistricting of privately owned land is likely to occur in only a limited number of cases, if any.

4.f. State and County Development Approvals

4.f.(1) Concerns about Development Approvals

As discussed below, a major concern among private landowners, developers, and other interested parties is that critical habitat designations will significantly affect State and county development approvals, even when there is no *Federal involvement*. They are concerned that areas designated as critical habitat will be interpreted by government officials as "environmentally sensitive," and that this will result in increased difficulty in securing development approvals for both new projects and for improvements to existing structures. The argument against approvals would be that critical habitat must be protected, and development should be limited or not allowed within critical habitat boundaries.

Related concerns are that critical habitat will result in more expensive environmental studies, delayed projects, costly project modifications, increased risks of projects being denied and, for projects that are approved, the possibility of high legal fees to fight lawsuits designed to prevent or substantially alter projects.

The primary focus of the concern lies with potentially controversial projects that: (1) are in portions of the critical habitat that were not previously recognized as being environmentally sensitive because they contain no listed species, and (2) require major funding or discretionary approvals by the State or county. Discretionary approvals could include redistricting by the State Land Use Commission, approvals by BLNR for projects in the State's Conservation District, General Plan or Community Plan amendments by county councils, use permits from the county councils for activities within the Special Management Areas, etc.

4.f.(2) State and County Environmental Review

Based on discussions with planning consultants and government officials, critical habitat designations are likely to increase the scope of required environmental analysis. The reason for this is that State and county agencies would require developers to address the impact of projects on critical habitat and related public concerns.

Subject to certain exemptions, a State Environmental Assessment (EA) or Environmental Impact Statement (EIS) is required for projects that: (1) use State or county lands or funds; (2) are in the Conservation District; (3) are in the Shoreline Setback Area (usually 40 feet inland from the certified shoreline); (4) require an amendment to a county plan that would designate land to some category other than Agriculture, Conservation or preservation; or (5) involve reclassification of State Conservation District lands. If a project "substantially affects a rare, threatened, or endangered species, or its habitat," then a State EIS might be required instead of the simpler and less expensive EA.

It is reasonable to assume that, although State law does not include the concept of critical habitat, the term "habitat" (which, in Hawai'i, includes areas that support listed threatened and endangered species) may eventually be interpreted by decision-makers to include "critical habitat" (which may include areas that could support listed species but presently do not). Those arguing in favor of this interpretation would include environmental groups, those who may oppose development, and possibly some government agencies. Eventually a developer may elect to, or be required to, submit a State EIS based on the fact that a project is located in a critical habitat. Once the precedent is set, succeeding developers may be required to submit State EISs under similar circumstances. Furthermore, a court may interpret "habitat" to include "critical habitat."

If critical habitat designation results in a requirement for a State EIS instead of an EA then, depending upon the complexity of the project, this could cost $25,000 to $75,000 more than an EA (based on estimates from Hawai'i planning firms). Also, preparing and processing a State EIS would take about two months longer than an EA. In addition, biological surveys could be required.

4.f.(3) Project Modification

If a proposed project requires major State or County approvals and is within critical habitat, developers are likely to be required by State and county agencies to request comments from the Service on the project. If the Service indicates that the project would have a negative impact on the habitat of listed species, then State and county agencies probably would require project mitigation to address Service concerns. This would be expected even with no *Federal involvement*. The cost of the mitigation would depend upon the circumstances.

4.f.(4) Affected Projects and Increased Costs

Over the next ten years, the number of development projects requiring environmental analysis is expected to be small because most of the proposed critical habitat units are (1) in mountainous areas that are unsuitable for development due to difficult access and terrain and the importance of their function as a watershed, and (2) within the State's Conservation District where land-use controls severely limit development or within the County's Agricultural District where land-use controls discourage development.

Depending on how much the proposed critical habitat designation contributes to additional environmental studies, project delays, project modifications, and potential project denials, the cost ranges from insignificant to substantial. However, information is insufficient to meaningfully quantify potential additional costs to developers, landowners and government agencies.

4.g. Reduced Property Values

4.g.(1) General Factors Underlying Reduced Property Values

Another issue raised by private landowners is that their property may lose value because of critical habitat designation. There is the concern that the designation will make their land less desirable by restricting its potential use or its development potential, or by increasing landowners' land-management or development costs.

Reduced property values need not be based in fact. Perceptions of the economic impact of critical habitat designation can result in a temporary loss in property value if landowners or buyers believe that the designation will restrict land uses, require modifications to the property, or cause project delays or other problems. Such a loss in property value can be experienced for as long as the perceptions persist.

Similarly, uncertainty about the impact of a critical habitat designation can cause a temporary reduction in land value that will continue until clear and correct information is distributed. To reduce the uncertainties, landowners may feel it necessary to retain counsel, land surveyors, biologists, and other specialists to determine the implications of the designation on their property. This can be particularly important for landowners who plan to sell their property and so must address concerns of potential buyers.

4.g.(2) Potentially Affected Properties and Impacts on Property Values

The concern of landowners about reduced property values primarily involves land that is: (1) privately owned; (2) in the State's Urban, Rural or Agricultural District; and (3) suitable for eventual development or commercial use based on access, gentle slopes, proximity to infrastructure and services, pleasing views, etc.

However, only a few such properties are proposed for critical habitat designation. There is no land in the Rural or Urban District proposed for critical habitat designation. Most of the remaining land is: (1) owned by the government; (2) in the Conservation District; or (3) less suitable for development due to poor access and difficult terrain.

After considering the above adjustments, privately-owned land in the Agricultural District proposed for critical habitat includes the following: approximately 1,658 acres in Unit A, 118 acres in Unit B2, 3 acres in Unit C3, 150 acres in Unit C4, 283 acres in Unit D1, 227 acres in Unit D2, 1380 acres in Unit E, 1 acre in Unit G1, 14 acres in Unit G4, 2 acres in Unit G5, 7000 acres in Unit H, 17 acres in Unit I1, 1,243 acres in Unit I2, 420 acres in Unit I3, 781 acres in Unit I4, and 40 acres in Unit L.

Assessed market values for these lands are comparatively low, ranging from $800 to $5,000 per acre. Some of this land is currently on the market, including land in Units H and I3, and the landowner is particularly concerned about the possible adverse impacts of designation on the portions of the sale property that are both within the Agricultural District and the proposed critical habitat. Other landowners have expressed concern about the impact on future sales.

While none of these lands will be subject to development pressures or significant changes in use in the foreseeable future, it remains possible that a buyer may wish to develop or make changes to the land use. Under the conditions described above for these properties, any decrease

in property value due to critical habitat designation is expected to be small—at least in theory and assuming fully informed buyers and sellers. Nevertheless, perceptions could contribute to a more significant reduction in property values. The worst-case scenario—and one that is not expected over the long term—would be a perception among potential buyers that the land should be valued as if it were subject to the same restrictions as land in the Conservation District. In this case, the decrease in property value for this Agricultural land could approach $569 million (see Section 4.e(6).

4.h. Condemnation of Property

Some landowners suspect that, following critical habitat designation, the Service eventually will condemn private property at depressed land values. However, the Service is not proposing nor is it contemplating purchasing any land being proposed for critical habitat designation.

On occasion, the Service does purchase land (e.g., land for a wildlife refuge). But this would be a separate action from critical habitat designation. As such, any proposed land purchase should be evaluated at the time it is proposed, and should be based on what is actually proposed. When the Service does purchase private property, the normal practice is to do so only when (1) the landowner is willing to sell the land, and (2) the price and other terms are acceptable to the landowner.

4.i. Costs to Investigate Implications of Critical Habitat

Many of the private landowners may hire attorneys or use their own professional staff to investigate the implications of critical habitat designation on their property. They may want to learn how the designation may affect (1) the use of their land (either through restrictions or new obligations), and (2) the value of their land.

On Maui, approximately 32 private landowners are included in the proposed critical habitat designation. While a few may be familiar with the Act, this analysis assumes that most, or all, of them will investigate the potential impacts on their properties.

An estimate of the costs involved with this investigation ranges from $53,000 to $304,000. This estimate is based on the following assumptions: (1) 20 to 32 landowners will investigate the implications of critical habitat; (2) the landowner and/or his attorneys or professional staff will spend about 15 to 40 hours on the investigation at rates of $150 to $200 per hour; and (3) Service staff will spend four to ten hours at $100 to $150 per hour responding to inquiries from each landowner.

4.j. Reduced Cooperation on Conservation Projects

Some parties have expressed concern that the ongoing activities of the Service to designate critical habitat could cause some landowners to cooperate less with the Service, NRCS, and DLNR on conservation projects. Landowners may cease participation in conservation projects to avoid drawing public attention to the fact that there may be threatened and endangered species on their property. In addition, landowners may reduce participation in these projects to avoid Federal involvement over their land management practices, out of concern that participation in conservation projects within critical habitat may result in project modifications that expand the project and increase the cost or that shift the focus of the project away from the landowner's initial intent. Finally, some landowners may hope to avoid having listed species discovered on their lands or having their lands identified as favorable habitat for listed species by not cooperating.

Reduced cooperation from landowners which, in fact, has occurred in Hawai‘i on occasion, may include refusal to allow biological surveys of their land, or refusal to participate in watershed and conservation partnership programs sponsored by the Service, NRCS and DLNR. It may also involve canceling participation in existing conservation projects. Reduced cooperation could result in lower-quality land management, environmental degradation, and increased risks to native plants and wildlife. If the environmental changes were valued, they could reflect an economic loss to society.

In addition, several large private landowners employ staff to oversee their natural resources management and their participation in conservation projects. Reduced cooperation in these projects could result in these positions being eliminated.

Any change from the current level of cooperation from landowners will depend on how much land is designated, which land is designated, actual and perceived restrictions on land use and development due to the designations, and perceived risks in the future. The assessment would be based on experiences in Hawai'i as well as in other states.

For the listed plants on Maui, the proposed critical habitat designation is expected to have a modest impact on land use and development over and above existing restrictions. This is especially true for land in the Conservation District, which accounts for 77 percent of the proposed critical habitat. As landowners gain experience with the actual effects of critical habitat, their concerns about whether or not to cooperate on conservation projects may diminish.

Nevertheless, the proposed area is relatively significant—amounting to 27 percent of Maui —and includes some privately owned land in the Agricultural District. As a result, a modest but undetermined reduction in cooperation may occur, along with a corresponding but undetermined environmental loss to society.

5. POTENTIAL IMPACTS TO SMALL ENTITIES

5.a. Regulatory Flexibility Act

Under the Regulatory Flexibility Act (RFA) (as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever a Federal agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of an agency certifies that the rule will not have a significant economic impact on a substantial number of small entities.

SBREFA amended the Regulatory Flexibility Act to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities.

This analysis determines whether this critical habitat designation potentially affects a "substantial number" of small entities in counties supporting critical habitat areas. It also quantifies the probable number of small businesses likely to experience a “significant economic impact.” While SBREFA does not explicitly define either “substantial number” or “significant economic

impact,"[11] the Environmental Protection Agency and other Federal agencies have interpreted these terms to represent an impact on 20 percent or more of the small entities in any industry and an effect equal or greater than three percent or more of a business' annual revenues.[11] In both tests, this analysis conservatively examines the total estimated section 7 costs calculated in earlier sections of this report, including those impacts that may be "attributable co-extensively" with the listing of the species.

5.b Impact on Small Entities

As noted earlier in this chapter, the analysis performs a survey of all potential activities and entities that may be affected the critical habitat designation. Based on this survey, the analysis identifies the following entities as being directly affected by the designation (activities are noted in parentheses):

Federal:

- NPS *(Haleakala National Park management)*
- U.S. Navy *(Kaho'olawe restoration activities)*
- Federal Communications Commission and/or Federal Aviation Administration *(construction of communication facilities)*
- Federal Emergency Management Agency *(emergency response activities)*
- NRCS (*conservation activities on agricultural land*)

State:

- State DLNR (*game management; State Park expansion; Recreational Area improvement; Trail construction; and Natural Area Reserve management*)
- State DHHL (*Kahikinui homesteads and economic development; and conservation activities*)
- Hawai'i Army National Guard (*military training exercises*)
- NRCS (*conservation activities on agricultural land*)
- State KIRC *(Kaho'olawe restoration activities)*

County:

- Maui County Department of Water Supply *(development of water infrastructure)*

Non-profit:

- East Maui and West Maui Mountains Watershed Partnerships *(conservation activities*)
- Hawai'i Television Broadcasters Association (*construction of broadcast antennae*)

[13] Regulatory Flexibility Act, 5 U.S.C. 601 et. seq.

[14] See U.S. Environmental Protection Agency, *Revised Interim Guidance for EPA Rulewriters: Regulatory Flexibility Act as amended by the Small Business Regulatory Enforcement Fairness Act*, March 29, 1999.

Private:

- Private landowners (conservation activities on agricultural land)
- Zond Pacific *(wind turbine construction)*

None of the governmental entities fit the description of "small entities" as developed by the Small Business Administration:

(1) Federal government agencies (i.e., NPS, U.S. Navy, NRCS, FCC, FAA and FEMA) are not small businesses under SBA guidelines.

(2) The RFA/SBREFA defines "small governmental jurisdiction" as the government of a city, county, town, school district, or special district with a population of less than 50,000. Maui County has a population greater than 50,000 (see Chapter II). As such, county agencies such as the Department of Water Supply are not considered "small entities."

(3) State governments are not considered "small government jurisdictions" under RFA. As such, DLNR, DHHL, KIRC, and the State National Guard would not be considered "small entities."

In addition, SBREFA defines "small organization" as any not-for-profit enterprise which is independently owned and operated and is not dominant in its field. The East Maui Watershed Partnership and the West Maui Mountains Watershed Partnership are not independently owned, but are public-private partnerships between Federal agencies, State agencies, private landowners and community organizations that are dominant in setting policy for watershed protection. While the definition of "small organization" leaves some room for interpretation, based on the above factors, this analysis does not consider either partnership to be a "small organization."

Similarly, the Hawai‘i Television Broadcasters Association (HTBA), which plans to construct an antennae to meet FCC broadcast requirements, is a Hawai‘i nonprofit corporation that represents the common interests of Hawai‘i's television broadcasters, each of which has annual revenues in excess of $750,000. As the entity representing all the broadcast stations, HTBA appears to be dominant in its field. Thus, HTBA does not appear to meet SBREFA's definition of a "small organization" for the purposes of this analysis.

Finally, Zond Pacific is a wholly owned subsidiary of Enron Wind Systems, which in turn in owned by Enron Renewable Energy Corporation. Because Zond Pacific was formed to develop wind projects in Hawai‘i that have not yet been constructed, it has no sales by which to evaluate whether it meets the definition of a small business (annual sales less than $750,000). However, on May 1, 2002, Zond Pacific filed a Chapter 11 Bankruptcy Petition, in which it noted that it was not a small business as defined by the bankruptcy code. Further, given the scale of the windfarm projects proposed (20 MW on Maui and 10 MW on Hawai‘i), it is expected that annual sales will exceed $750,000 once the projects are complete. Thus, this analysis does not consider Zond Pacific to be a "small business."

Given these adjustments, the primary projects and activities that might be affected by the proposed designation that could affect small entities include conservation activities by ranching operations.

As discussed earlier in the chapter, ranching operations are likely to enter into one to four section 7 consultations with the Service within the next ten years. In 2000, there were 170 cattle livestock operations in Maui County. The combined cattle sales of all of these operations in 2000 was about $3.2 million (Statistics of Hawai'i Agriculture, 2000). Since this implies average annual cattle sales per business of $19,000, it is likely that all or almost all of the Maui County cattle operations meet the definition of a small business (annual sales less than $750,000). Thus, the critical habitat designation may affect one to four businesses out of 170 (one to two percent) of the small businesses in the cattle industry in Maui County.

Based on the above analysis, a significant economic impact on a substantial number of small entities will not result from the proposed critical habitat designation. However, even though the proposed designation would not affect a "substantial" number of small businesses in each industry, an estimate of the impact is provided below.

The cost of consultations with ranching operations is $31,400 to $164,800 (Section 3.g., Table VI-3) (reflecting an estimated two to eight consultations over the next ten years), of which $21,000 to $92,000 is attributable to critical habitat. Possible project modification costs range from $0 to $400,000, all of which is attributable to critical habitat (Section 3.g., Table VI-3). The consultation costs primarily reflect costs to the Service and NRCS to participate in the consultations. However, as noted in section 2.b.(2), participants in consultations normally spend time assembling information about the site and their proposed project or activity, preparing for one or more meetings, participating in meetings, arranging for biological surveys if needed, and responding to correspondence and phone calls. As Table VI-I indicates, the estimated cost of a non-Federal applicant for a Medium level consultation is $4,200. Thus, the estimated cost to ranching operations for consultations over the next ten years is $8,400 to $33,600. Biological surveys may be required as part of the consultation, which could increase the cost to ranching operations an additional $39,200, as these are generally paid for by the applicant. Thus, the total potential costs associated with consultation to ranching operations is $8,400 to $72,800. Absent critical habitat, these costs would be estimated as $2,800 to $42,400 (see Section 3.g.); thus, $5,600 to $30,400 of the costs are attributable to critical habitat.

Therefore, based on the above analysis, the proposed critical habitat designation will not have a significant economic impact on a substantial number of small entities.

6. SECTION 7-RELATED ECONOMIC BENEFITS

6.a. Introduction

Critical habitat designation is likely to provide economic benefits to the region, as well as to society as a whole. These benefits fall into two categories. Direct benefits are those directly attributable to the activities associated with compliance with the habitat designation, while indirect benefits arise from preservation of threatened and endangered species and other environmental improvements encouraged by critical habitat designation. Direct and indirect economic benefits may be manifested in two ways: changes in regional economic activity and changes in social welfare.

Regional economic and social welfare measures represent alternate ways to view the benefits of critical habitat designation. Regional economic benefits refer to an increase in revenues or employment in a given area. Changes in regional economic activity are an important aspect of policy and project evaluation because the costs of certain actions may be more concentrated among regional residents than are the benefits. From a national perspective, however, increases in activity in the region reflect a redistribution of activity from another geographic area, not a net increase in national economic activity. The exception is inflow from non-domestic sources.

"Social welfare benefits" are measured by individuals' "willingness to pay." The sum of an individual's willingness to pay for something, net of the costs associated with its consumption, is referred to as consumer surplus. Consumer surplus is the standard metric used to evaluate alternate allocations of society's resources, as in cost-benefit analysis of environmental programs. While one might argue that local residents are the primary beneficiaries, welfare benefits associated with critical habitat designation, to the extent that it enhances the nation's stock of natural assets, flow to society at large.

However, the development of quantitative estimates associated with the benefits of the proposed designation is impeded by the scarcity of available studies and information relating to the size and value of beneficial changes that are likely to occur as a result of listing a species or designating critical habitat. In particular, the following information is not currently available: 1) quantified data on the value of the Maui and Kaho'olawe species; and 2) quantified data on the change in the quality of the ecosystem and the species as a result of the designation (for example, how many fewer ungulates will roam into the critical habitat, how many fewer invasive plants will be introduced as a result, and therefore how many more of the endangered plants will be present in the area). As a result, it is not possible, given the information that is currently available, to estimate the value associated with ecosystem preservation that could be ascribed to critical habitat designation. Thus, categories of benefits are discussed in qualitative terms. It is not intended to provide a comprehensive analysis of the benefits that could result from section 7 of the Act in general, or of critical habitat designation in particular. In short, the Service believes that the benefits of critical habitat designation are best expressed in biological terms that can be weighed against the expected costs of the rulemaking.

6.b. Direct Benefits

6.b.(1) Regional Economic Benefits

Regional Economic Activity Associated with Medical/Pharmaceutical Benefits

Many of the threatened and endangered plant species had ethnobotanical value to the Native Hawaiians, and at least one species has known medicinal value. While it is possible that other listed plants have an undiscovered medicinal value, there is no way to determine the statistical probability of this occurrence or the economic value of an as-yet undiscovered medicinal use. Moreover, it is impossible to determine what contribution critical habitat designation has to the conservation of that as-yet unspecified plant.

Regional Economic Activity Generated by Conservation Management

In FY 2001, the Service spent an estimated $310,832 on conservation management for listed plants in Maui, including expenditures on salaries, equipment, supplies and services. In turn, workers and companies that benefited from the Service's expenditures on conservation management

purchased additional goods and services, thereby generating additional economic activity (referred to as the multiplier effect). In total, the initial Service expenditure generated approximately $652,747 in direct and indirect sales for the year on Maui and other islands, and supported about 11 jobs in Hawai'i (based on multipliers from the Hawai'i Input-Output Model, DBEDT, 1998).[11] The State and other organizations also spend a considerable amount on conservation management that involves listed plants in Maui (e.g., State expenditures to manage NARs).

If the proposed critical habitat results in an increase in conservation management activities in Maui, associated expenditures may increase economic activity in Hawai'i. The amount of future increase in conservation management activities is speculative and not quantifiable. However, based on State multipliers, each additional $1 million spent in Hawai'i would generate approximately $2.1 million in direct and indirect sales in Hawai'i, and would support approximately 35 direct and indirect jobs. Thus, if all of the 123,000 acres of mountainous land in Maui that is proposed for critical habitat designation were to be managed at an average cost of $30 to $80 per acre (which is not expected unless mandated by a court order), then the resulting expenditure of about $3.7 million per year would generate roughly $7.8 million per year in direct and indirect sales in Hawai'i, and would support about 130 direct and indirect jobs.

It is important to note, however, that expansion of Hawai'i's economy through these expenditures is contingent upon how they are financed. If the increase in conservation management is financed by an influx of new funds from outside the State, then the increase in expenditures will contribute to increased economic activity in Hawai'i. New funding for conservation management could come from the Federal government, grants from non-profit organizations outside Hawai'i, or other sources. While this is possible, no known projections are available that indicate a significant increase in funding for conservation management from outside Hawai'i due to the proposed critical habitat designation.

If increased expenditures on conservation management are funded from within Hawai'i, or through funds from outside sources already intended for use in the State, there would be no significant change in economic activity. Similarly, as discussed in the introduction, increased funding of conservation programs in Hawai'i would result in no significant change in economic activity for the economy as a whole because any funds spent in Hawai'i would be at the expense of expenditures elsewhere (e.g., funds diverted from some other Federal program).

Regional Economic Activity Associated with Ecotourism

Commercial ecotours, via foot hikes, horseback riding, and biking, led by guides featuring Maui's unique ecosystems and endemic plants, are offered in portions of the proposed critical

[11] The Hawai'i Input-Output Model is an economic forecasting tool that can be used to estimate the "ripple effect" of changes in regional expenditures. That is, as dollars are spent in or withdrawn from a particular sector of the economy, not only is that sector affected directly but also the other sectors that supply goods and services to it are affected indirectly. The magnitude of this "ripple effect" is captured by estimates known as "multipliers". For example, a multiplier of two indicates that $1 worth of expenditures in a particular sector is responsible for an overall contribution of $2 to the local economy. It is important to note that "direct" and "indirect" in the context of input-output modeling refer to primary and secondary changes in sales and employment associated with expenditures. They do not, in this context, distinguish direct from indirect costs or benefits, as discussed in the introduction.

habitat. These may include guided tours into Haleakala National Park (Units H, I, J, K and L), horseback riding tours on the slopes of Haleakala (Units H and I) or along the coast (Unit C), and hiking tours within the West Maui or East Maui Watersheds (Units A, B, D, I, J, K, and L). Designation could benefit these operations by providing a marketing dimension that enhances the appeal of the ecotours to visitors. However, this benefit is expected to be slight inasmuch as these areas are already regarded as being special due to their existing natural and cultural resources. In addition, in most if not all cases, the Service prefers that these commercial operations do not feature visits to view threatened and endangered plants since revealing their locations increases the risk that a species may be collected or damaged or its habitat harmed.

Regional Economic Activity Associated with Avoided Costs to Developers

The main advantage to developers of critical habitat designations is to provide them with more information regarding project siting. For example, knowledge of critical habitat boundaries can help developers avoid facing issues related to listed species. In the future, this may reduce delays and resultant revenue impacts associated with project modifications.

Other Regional Economic Activities

Several types of businesses may experience increase in demand as a result of the presence of the plants and/or their proposed critical habitat. Such businesses may include, but are not limited to, private botanists and fence suppliers and builders. The Service often requires fencing as a part of project modifications in order to protect the plants from ungulates. In addition, various conservation management activities may also involve building exclosure fences. As such, an unknown number of businesses in this sector may experience increased demand. Likewise, surveys are often conducted for the plants, and this may create unknown number of job opportunities for private botanists in Maui. However, it is impossible to forecast the number of such businesses that would experience economic benefit from the plants or make quantitative estimate of such benefit.

6.b.(2) Social Welfare Benefits of Habitat Designation

Critical habitat designation could also generate direct social welfare benefits. For example, economic literature has demonstrated individual's willingness-to-pay for preservation of open space, both in general, as well as specifically in the vicinity of their residence. Similarly, a survey sponsored by the Trust for Public Land and conducted in April 2000, revealed the approximate amount that Maui County voters were willing to pay to better protect open space, wildlife habitats, recreational areas, and land around rivers and streams. According to the survey, approximately 66 percent of the voters would support a “community lands and open space preservation fund” to protect land and water in Maui County, and funded by a 2.5-percent increase in the property tax. This works out to a total of about $1.38 million per year (based on estimated property-tax revenues of $83.4 million in FY 2000 x 2.5 percent x 66 percent), or an average of about $11 per resident per year (based on a county population of 128,100 in 2000). Thus, to the extent that designation results in preservation of open lands that might otherwise be developed, some welfare benefits may be created. However, the proposed critical habitat is already kept as open space. As such, these benefits are likely to be insignificant.

6.c. Indirect Benefits

6.c.(1) Social Welfare Benefits of Endangered Species Preservation

The primary purpose of critical habitat is to protect areas that are needed to conserve threatened and endangered species. Many economic studies have demonstrated social welfare benefits associated with the conservation and recovery of endangered and threatened species (e.g., Bishop 1978 and 1980; Brookshire and Eubanks, 1983; Boyle and Bishop, 1986; Hageman, 1985; Samples *et al*., 1986; Stoll and Johnson, 1984). Most research in this area has focused on mammals, birds, and fish. Depending upon the species, this literature indicates that households are willing to pay between $6 and $70 per year for species conservation, or one-time payments up to $216 (bald eagle, Loomis and White, 1996). These values may be motivated by expectations of future viewing opportunities, or a desire to preserve important natural resources for future generations.

Willingness-to-pay for a single species of endangered plant is likely to be lower than these amounts, particularly if the species is not well known to the general public. Few studies have focused on the value of preserving endangered plants and, given the scope of this analysis, no primary economic research was conducted on the value of species preservation. It is important to note, however, that some of these plant species have particular significance in an ethnobotanical context; that is, they are found in historical plant lore and in the agricultural customs of Native Hawaiians.

However, the development of quantitative estimates associated with the benefits of the proposed designation is impeded by the scarcity of available studies and information relating to the size and value of beneficial changes that are likely to occur as a result of listing a species or designating critical habitat. In particular, the following information is not currently available: 1) quantified data on the value of the Maui and Kaho'olawe species; and 2) quantified data on the change in the quality of the ecosystem and the species as a result of the designation (for example, how many fewer ungulates will roam into the critical habitat, how many fewer invasive plants will be introduced as a result, and therefore how many more of the endangered plants will be present in the area). As a result, it is not possible, given the information that is currently available, to estimate the value associated with ecosystem preservation that could be ascribed to critical habitat designation. Thus, categories of benefits are discussed in qualitative terms.

Some landowners have argued that critical habitat would make little or no contribution to the ultimate conservation of Hawai'i's threatened and endangered plants. They observe that many of these native plants are vulnerable because they are weaker and more fragile than non-native plants, and they grow more slowly. In particular, native plants lack the natural defenses (e.g., thorns, bitter tastes, offensive odors, etc.) to protect them from non-native pests (insects, diseases, rats, nematodes, birds, grazing animals, etc.), a vulnerability that reflects the fact that native plants evolved in isolation in a benign environment. Finally, many of the native plants cannot compete against aggressive fast-growing exotic plants, particularly when they are stressed, such as during droughts. In the long term, some argue that many listed plants will not be able to survive in the wild, with or without critical habitat designations. Nevertheless, critical habitat designations are mandated by law. And as long as these designations enhance the probability of the survival and conservation of listed species, regardless of how small that probability, critical habitat has value.

6.c.(2) Social Welfare Benefits of Broader Ecological Improvements

As discussed above, the survival and conservation of Hawai'i's native plants will require controlling feral ungulates. It is also recognized that ungulates cause additional environmental problems. Their browsing, digging, and trampling contribute to a loss of native habitat which, in turn, contributes to the loss of listed birds and other native birds, the endangered Hawaiian bat, and snails and insects that are either currently listed or are candidates for listing. Also, mosquitoes hatched in pig wallows frequently carry avian malaria and pox that contribute to the decline of native bird populations. Furthermore, certain ungulates (especially sheep and goats) can remove vegetation to such an extent that erosion becomes a major issue. In turn, the loss of vegetation can degrade watersheds, and the soil run-off can increase silt in streams thereby harming aquatic life; create layers of mud on otherwise sandy beaches; and bury near-shore reefs, thereby harming marine communities. Adverse impacts are more severe for bays and other protected marine environments that are not flushed by strong ocean currents.

In this manner, if feral ungulate control were undertaken for purposes of critical habitat, some complementary environmental improvements may be expected. These improvements may in turn improve ecosystem health and contribute to the welfare of residents and visitors. Similar to the benefits of species preservation discussed above, welfare benefits have also been ascribed to preservation of general biodiversity and ecosystem function (e.g., Pearce and Moran, 1994). However, determining the nature and extent of improvements specifically attributable to critical habitat designations would be difficult, if not impossible. For this reason, coupled with a lack of existing economic research, these potential broader ecological benefits are not quantified.

7. SUMMARY OF ECONOMIC IMPACTS

For economic activities affected by the proposed plant critical habitat in the next ten years, Table VI-3 summarizes the total section 7-related costs and benefits attributable to the plant listings, as well as those which are attributable solely to the proposed critical habitat designation.

These findings reflect the fact that very few new developments, commercial projects, land uses, and activities are expected in the ten proposed critical habitat units. This is due to (1) lands that are largely unsuitable for development and most other activities because of their rugged mountain terrain, lack of access, and remote locations; and (2) existing land-use controls that severely limit development and most other activities in much of the proposed designation. Also, a number of projects and activities in the proposed critical habitat would not be subject to section 7 consultation because there is no *Federal involvement,* or the activities involve O&M of existing man-made features and structures, or the projects or activities would not impact the *primary constituent elements* essential to the survival and conservation of the plants.

Thus, as shown in Table VI-3, the total section 7-related costs associated with the plant species listings are $471,700 to $2,379,600 while those attributable solely to the critical habitat designation are $310,000 to $2,095,500. These costs represent, in the worst case, about .08 percent of the total personal income of Maui County in 1999. In addition, indirect costs could add more to the totals.

Designation of the proposed critical habitat and related actions taken to control threats to the plant species (e.g., ungulate control) may also generate economic benefits. These benefits may be related directly or indirectly to designation and manifest in increased regional economic activity or

social welfare. For the former, to the extent that critical habitat designation leads to additional conservation management activities funded by out-of-state sources, a local increase in revenues and employment may result. For the latter, species preservation and recovery and other complementary ecological improvements may generate social welfare benefits for residents and non-residents alike. However, the development of quantitative estimates associated with the benefits of the proposed designation is impeded by the scarcity of available studies and information relating to the size and value of beneficial changes that are likely to occur as a result of listing a species or designating critical habitat. In particular, the following information is not currently available: 1) quantified data on the value of the Maui and Kaho'olawe species; and 2) quantified data on the change in the quality of the ecosystem and the species as a result of the designation (for example, how many fewer ungulates will roam into the critical habitat, how many fewer invasive plants will be introduced as a result, and therefore how many more of the endangered plants will be present in the area). As a result, it is not possible, given the information that is currently available, to estimate the value associated with ecosystem preservation that could be ascribed to critical habitat designation. Thus, categories of benefits are discussed in qualitative terms.

Table VI-3. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat

(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

Item	Total		Share to CH		Explanation
	Low	High	Low	High	
DIRECT SECTION 7 COSTS					
Management of Game Hunting					
State-Managed Lands, Consultations	$ 4,100	$ 12,700	$ 1,200	$ 5,800	Consultation due to Pittman-Robertson funding
State-Managed Lands, PMs	$ 115,500	$ 185,000	$ 92,400	$ 148,000	Based on prior PMs
National Parks					
Haleakala National Park, Consultation for Fencing project	$ 11,500	$ 11,500	$ 7,700	$ 7,700	Consultation due to National Park Service involvement
Haleakala National Park, Fencing PMs	None	None	None	None	PMs, if any, would be minor due to beneficial nature of
Haleakala National Park, Consultation for Trail Improvement project	$ 11,500	$ 11,500	$ 7,700	$ 7,700	Consultation due to National Park Service involvement
Haleakala National Park, Trail improvement PMs	Minor	Minor	Minor	Minor	PMs, if any, would be minor since the project will be primarily located within the existing footprint of the trail
State Parks and Trails					
Wai'anapanapa State Park, Consultation	$ 19,400	$ 19,400	$ -	$ -	Consultation due to possible NPS funding
Wai'anapanapa State Park, PMs	None	None	None	None	No PMs expected since the park already is subject to
Polipoli Spring State Recreational Area, Consultation	$ 8,900	$ 19,400	$ 8,900	$ 19,400	Consultation due to possible NPS funding
Polipoli Spring State Recreational Area, PMs	Minor	Minor	Minor	Minor	PMs, if any, would be minor since the project will be in already disturbed area.
Na Ala Hele Trail and Access System, Consultations	None	None	None	None	No known Fed involvement
Department of Hawaiian Home Lands					
Kahikinui , Consultations	$ 15,700	$ 78,500	$ 15,700	$ 78,500	Consultations due to Fed funding
Kahikinui PMs	None	None	None	None	
Pu'u o Kali, Consultations	None	None	None	None	No projects planned in CH and no Fed involvement
Kaho'olawe					
Kaho'olawe, Consultations	$ 10,400	$ 78,500	$ 10,400	$ 78,500	Consultations due to possible Fed funding
Kaho'olawe, PMs	Minor	Minor	Minor	Minor	PMs, if any, would be minor due to the beneficial nature of the activities
Conservation Projects					
West Maui Mountains Watershed Partnership, Consultations	$ 44,600	$ 60,300	$ 23,700	$ 34,200	Consultation due to likely Fed funding
West Maui Mountains Watershed Partnership, PMs	None	None	None	None	
East Maui Watershed Partnership, Consultations	$ 44,600	$ 60,300	$ 23,700	$ 34,200	Consultation due to possible Service funding
East Maui Watershed Partnership, PMs	None	None	None	None	
Kanaio Natural Area Reserve, Consultation	$ 10,100	$ 20,600	$ -	$ -	Consultation due to possible Service funding
Kanaio Natural Area Reserve, PMs	None	None	None	None	
Other Conservation, Consultation	$ 15,700	$ 62,800	$ 10,500	$ 42,000	Consultation due to possible Service or NRCS funding
Other Conservation, PMs	None	None	None	None	

Table VI-3. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat

(10-year estimates)
(continued)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

Item	Total		Share to CH		Explanation
	Low	High	Low	High	
DIRECT SECTION 7 COSTS (cont'd)					
Agriculture and Ranching Operations					
Federally-sponsored operations, consultations	$ 31,400	$ 164,800	$ 21,000	$ 92,000	Consultation due to Fed funding
EQIP or CRP funded projects, PMs	$ -	$ 400,000	$ -	$ 400,000	PMs could involve foregoing Fed funding
Electric Generation and Delivery					
Kaheawa Pastures 20 MW Windfarm, Consultation	$ 19,600	$ 19,600	$ 19,600	$ 19,600	Consultation due to FAA permit
Kaheawa Pastures 20 MW Windfarm, PMs	$ -	$ 150,000	$ -	$ 150,000	Could involve moving the site, additional botanical survey and other preservation measures
Communications Facilities					
Hawaii Television Broadcasters Association Antennae, Consultation	$ 27,100	$ 40,300	$ -	$ 40,300	Consultation due to FCC permit and possible FAA permit and Fed funding
Hawaii Television Broadcasters Association Antennae, PMs	$ -	$ 150,000	$ -	$ 150,000	Could involve moving the site, additional botanical survey and other preservation measures
New Facilities, Consultations	$ 8,900	$ 39,200	$ -	$ 39,200	Consultation due to FCC and/or FAA permits
New Facilities, PMs	$ -	$ 200,000	$ -	$ 200,000	Could include moving the site
Residential Development					
Potential Development within Agricultural District, Consultations	None	None	None	None	No projects planned in CH and no known Fed involvement
Water Systems					
Water improvement projects, Consultations	$ -	$ 68,000	$ -	$ 26,400	Possible water infrastructure construction with Fed funding
Water improvement projects, PMs	$ -	$ 200,000	$ -	$ 200,000	Could involve moving the site
Military Activities					
Hawai'i Army National Guard, Consultations	$ 15,700	$ 15,700	$ 10,500	$ 10,500	Consultation due to Fed funding
Hawai'i Army National Guard, PMs	Minor	Minor	Minor	Minor	Minor PMs due to already established NRMP with input from the Service
U.S. Military, Consultations	None	None	None	None	No planned military activity in CH
Roads, Consultations	None	None	None	None	No projects planned in CH
Ecotourism, Consultations	None	None	None	None	No known Fed involvement
Natural Disasters					
Recovery Projects, Consultations	$ 4,000	$ 7,500	$ 4,000	$ 7,500	Consultation due to FEMA funding
Recovery Projects, PMs	Minor	Minor	Minor	Minor	Few adverse impacts anticipated

Table VI-3. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat

(10-year estimates)
(continued)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

Item	Total		Share to CH		Explanation
	Low	High	Low	High	
INDIRECT COSTS *					
Management of Game Mammals and Loss of Hunting Lands	Minor	Minor	Minor	Minor	Slight probability of a major impact
Conservation Management	Minor	Minor	Minor	Minor	No obligation to proactively manage lands to control threats, but an undetermined probability of a major impact
Subsistence and Native Hawaiian Traditional and Cultural Practices	Minor	Minor	Minor	Minor	Undetermined, but slight, probability of a moderate impact
Redistricting of Land by the State	Small	Small	Small	Small	Small probability of significant impacts
State and County Development Approvals	Modest	Modest	Modest	Modest	Few anticipated projects, but costs to projects range from insignificant to substantial
Reduced Property Values	Small	Small	Small	Small	Small probability of significant impacts
Condemnation of Property	None	None	None	None	No condemnation resulting from CH. Also, the Service acquires land by negotiation, not condemnation
Investigate Implications of CH	$ 53,000	$ 304,000	$ 53,000	$ 304,000	32 private landowners may investigate the implications of CH on their lands
Reduced Cooperation on Conservation Projects	Modest	Modest	Modest	Modest	Some landowners want to avoid CH designation
TOTAL COSTS					
Direct	$ 418,700	$ 2,075,600	$ 257,000	$ 1,791,500	
Indirect	$ 53,000	$ 304,000	$ 53,000	$ 304,000	
Direct and Indirect	$ 471,700	$ 2,379,600	$ 310,000	$ 2,095,500	
Discounted Present Value	$ 331,302	$ 1,671,331	$ 217,731	$ 1,471,792	Present value and annualized calculations are based on the OMB prescribed seven percent discount rate and the assumption that total costs are distributed evenly over the entire period of analysis.
Annualized	$ 47,170	$ 237,960	$ 31,000	$ 209,550	

*** Although the analysis does provide general estimates of some of the potential indirect costs shown below, not all of the estimates are summarized in this table. Because some of these indirect costs are highly speculative, this table instead reports qualitatively on their likelihood and magnitude. For additional information on any of these indirect impacts, the reader should refer to the economic cost and benefit chapter of the analysis. Only those costs deemed more likely to occur are included in this summary table in order to present the most probable overall impact of critical habitat designation.**

Table VI-3. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat

(10-year estimates)
(continued)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal ne = not estimated

Item	Total		Share to CH		Explanation
	Low	High	Low	High	
DIRECT BENEFITS					
Regional Economic Activity Associated with Medical/Pharmaceutical Benefits	Minor	Minor	Minor	Minor	No way to determine statistical probability or economic value of future medicinal use or contribution of critical habitat.
Regional Economic Activity Generated by Conservation Management	Minor	Minor	Minor	Minor	Much of the benefit likely accrued elsewhere if financed with off-island sources
Regional Economic Activity Associated with Ecotourism	Minor	Minor	Minor	Minor	The Service prefers that guides do not feature visits to endangered plants
Regional Economic Activity Associated with Avoided Cost to Developers	Minor	Minor	Minor	Minor	Helps developers site projects
Social Welfare Benefits of Habitat Designation	Minor	Minor	Minor	Minor	The designation may result in preservation of open lands
INDIRECT BENEFITS					
Social Welfare Benefits of Endangered Species Preservation	ne	ne	ne	ne	Difficult to estimate preservation benefits and their value
Social Welfare Benefits of Broader Ecological Improvements	ne	ne	ne	ne	Difficult to determine environmental improvements attributable to the implementation of section 7

APPENDIX VI-A

Information on Hunting and Game-Mammal Management

1. INTRODUCTION

Presented below is background information on hunting on Maui and DLNR's game-mammal management. The material is used in Chapter VI in addressing direct and indirect economic impacts of critical habitat on game-mammal management. Subjects addressed include the following: hunting activity on Maui, economic activity associated with hunting, the value of hunting to hunters, DLNR game management, the loss of hunting areas to the *palila* critical habitat, information on the Pittman-Robertson Act, consultation with the Service on Pittman-Robertson projects, and recent changes in hunting fees.

2. HUNTING ACTIVITY ON MAUI

Hunting is an important activity for Maui, because it provides recreation, subsistence, and a desired lifestyle. Hunting is largely a local activity, with approximately 5 percent of the game-mammal hunters coming from off-island (based on DLNR estimates, 2001). However, the creation of a DLNR website about hunting in Hawai‘i has increased phone calls from potential visitors requesting additional information about hunting on Maui.

Game mammals hunted on the island include feral pigs, goats and axis deer. Game birds include pheasant (two species), quail (two species), Francolin (two species), chukar partridge, dove (two species), and wild turkey.

3. ECONOMIC ACTIVITY ASSOCIATED WITH HUNTING

In 1996, 23,000 hunters in Hawai'i, most of whom were local residents, spent an estimated 258,000 days and about $16.4 million on hunting, of which about $8 million was trip-related and about $8.4 million was for equipment and other expenses (1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation). Approximately 70 percent of their hunting trips were spent hunting game mammals and the remaining trips were for game birds. Based on hunting licenses issued, about 19 percent of the State's hunters live on Maui (information provided by DLNR, 2001).

Companies that supply goods and services to hunters, and the employees of these companies, in turn purchase goods and services from other companies, thereby creating even more sales, and so on. These "indirect" sales are scattered throughout the economy and the State. When both "direct" and "indirect" sales are included, total Statewide sales due to hunting in Hawai‘i amounted to about $31.8 million in 1996. In turn, this economic activity supported an estimated 580 jobs and generated an estimated $13.5 million in income (an average of about $23,300 per job). These estimates are based on multipliers from the Hawai‘i Input-Output Model. (DBEDT, 1998).

In 1996, economic activity supported by just game-mammal hunting on Maui amounted to about $2.2 million in direct sales, $4.2 million in total direct and indirect sales, 77 jobs, and $1.8 million in income. These figures are order-of-magnitude estimates based on 70 percent of the hunting trips being spent hunting game mammals, and 19 percent of the State's hunting activity taking place on Maui.

4. VALUE OF HUNTING TO HUNTERS

The net value of hunting opportunities to hunters is based on what they would be willing to pay above and beyond their expenditures for hunting equipment, supplies, and travel to participate. "Consumer surplus" is the standard measure of value used in cost-benefit analyses. The Statewide value of all hunting for 1996 is estimated at $6.5 million, based on (1) the assumption that hunters value their experience at $25 per day; and (2) they hunted a total of 258,000 days that year. For Maui, the value of just game hunting amounted to about $860,000 ($6.5 million x 70 percent x 19 percent). These figures on the value of game hunting should be interpreted as order-of-magnitude estimates, not precise estimates.

The valuation of hunting at $25 per day is consistent with estimates of the valuation of hunting from the following economic studies:

- $19.18 or $26.86 per day for hunting deer in Idaho in 1986, with the different amounts being based on methodology, but with the higher amount being deemed more accurate (Donnell and Nelson, 1986)

- $22.45 or $28.50 per day hunting for jack rabbits and game birds in Idaho in 1986, with the different amounts being based on methodology, but with the higher amount being deemed more accurate (Young, et al. 1986)

- $21.66 or $24.44 per day for hunting pheasant in Idaho in 1986, with the different amounts being based on methodology, but with the higher amount being deemed more accurate (Young, et al., 1986)

- $16.56 per day for hunting pheasant in Idaho in 1971 (Shulstad, 1978)

A valuation of hunting based on the market value of the meat harvested in excess of the hunters' expenditures on hunting (i.e., the subsistence value of hunting) would be lower. In effect, hunting is largely a recreational pursuit for which expenditures on equipment and travel, and the value of the time spent hunting and butchering the animals, are partially offset by the value of the meat harvested.

5. DLNR GAME MANAGEMENT

DLNR is the State agency responsible for managing game-mammal populations in State Hunting Units. However, it must carry out this responsibility in the context of two conflicting mandates: provide for sustained-yield recreational hunting in some of the State Hunting Units and protect native ecosystems and plants in other areas.

DLNR achieves what they regard as a reasonable balance between the two mandates by permitting recreational hunting based on site conditions (e.g., animal population and food supply)

and habitat quality (nearly pristine, highly degraded, or somewhere in between) (see Appendix VI-B). For example, the most liberal hunting (e.g., year-round pig hunting) is permitted in nearly pristine areas that have suffered the least environmental damage. This helps keep game-mammal populations low in these sensitive areas, thereby minimizing harm to native ecosystems and to endangered and threatened plants. However, hunting is not possible in many remote areas that are inaccessible to hunters.

In areas where the native forest is highly degraded and DLNR sees no hope that the native vegetation will return, hunting is restricted in order to sustain larger populations of game mammals (see below for the methods used to restrict hunting). When hunting is restricted, the larger populations allow hunters to harvest more animals each year than would be the case with smaller populations. In addition to the recreational benefits to hunters of having higher game harvests, reasonable numbers of game mammals are available to browse on the non-native plants and weeds, thereby helping control the seed reservoir of noxious non-native plants and their spread into other areas.

Finally, in degraded areas, exclosure fencing of small areas (of less than two acres) may be used to protect rare native plants and their seeds from foraging animals. These exclosures are small enough to make it practical to weed the overgrowth of aggressive alien plants which would otherwise choke out the native plants or carry a wildfire.

According to DLNR, the combined strategy of using game mammals to help control non-native plants and weeds in degraded areas and using hunters to help control ungulate populations in pristine areas is accomplished at little cost to the taxpayer while providing recreational benefits to hunters.

However, it should be noted that Service staff and expert biologists question the effectiveness of DLNR's game-management approach in protecting native forests, arguing that so long as large populations of feral ungulates are free to range, they will migrate into areas that are not degraded, possibly because they are fleeing from hunters or searching for better forage than what they can find in degraded game-production areas. In turn, their migration into these areas will contribute to the loss of listed plants and to the spread of noxious plants. Also, the State exclosures are regarded by the Service as too small to sustain viable populations of threatened and endangered plants (Service, *Recovery Plan for the Multi-Island Plants*, 1999).

The methods employed by DLNR to manage game-mammal populations take advantage of the fact that the demand for hunting opportunities exceeds the availability of game mammals. Within each State Hunting Unit, DLNR controls the amount of hunting activity by using such restrictions as: bag limits, hunting method (rifle, muzzleloader, bow and arrow, dogs and knives); days allowed (week-ends only), hunting seasons; hours of the day; and for some areas, a limit on the number of daily permits issued (Hawai‘i Administrative Rule, Title 13, Chapter 123). However, hunting activity falls off if hunters' success rates are low (which usually occurs when too many hunters are after too few animals) or if certain areas are difficult to access. Also, some of the hunting restrictions are for safety purposes: limiting the number of hunters prevents dangerous overcrowding and risks to both hunters and other recreational users in the area (e.g., hikers and campers).

If the game-mammal surveys indicate that the game-mammal populations have become too high for an area, DLNR responds by allowing more hunting. But if increased hunting does not reduce the population sufficiently—possibly because of difficult access to a remote area—then

DLNR may direct staff to remove the animals where economically feasible.

To provide guidance for adjusting the controls on hunting activity, DLNR monitors the following: (1) hunting activity (including the number of hunting trips, game harvests by type of game, and success rates); (2) game populations (using habitat transects, harvest data, hunter reports, and aerial and ground surveys); and (3) vegetation (including the coverage, composition by type of plant, invasion by non-native plants, trends, comparisons with vegetation inside animal exclosures, and impacts to plants from game mammals). But the management of game-mammal populations is not an exact science. For example, animal population estimates may be inaccurate; populations vary with rainfall and food availability; and animals move from one area to another.

6. LOSS OF HUNTING AREA UNDER THE *PALILA* DECISION

Based on past experience, most hunters in Hawai'i associate critical habitat designation with loss of prized hunting areas. Although a parallel situation does not exist with the proposed critical habitat on Maui, the association is based on the *palila* critical habitat on the Island of Hawai‘i.

In 1975, the Service listed the *palila (Psittirostra bailleui),* a Hawaiian honeycreeper (a bird), as an endangered species. The *palila* depends entirely on the *mamane-naio* ecosystem—a broad band of sparse forest encircling Mauna Kea between about 7,000 and 10,000 feet elevation. In 1977, in an effort to further protect the *palila*, the Service designated the *palila* critical habitat, encompassing about 67,000 acres (105 square miles) of hunting land.

The *palila* were at risk because sheep and goats on Mauna Kea browsed on the *mamane* trees in the *mamane-naio* ecosystem, which was very destructive to the *palila's* habitat. Starting in the late 1940s, the population of game mammals was allowed to increase on the mountain to allow sustained harvest by hunters. Even after the *palila* was listed as endangered and its critical habitat was designated, DLNR continued to manage the feral sheep and goat populations at sustainable levels for hunting, causing continued harm to the *palila's* habitat.

This situation led the Sierra Club Legal Defense Fund to file a lawsuit in Federal court, *Palila v. Hawaii Department of Land and Natural Resources,* to require DLNR to remove the feral sheep and goats from Mauna Kea. The case tested the prohibition in the Act on *taking* of any endangered species of fish or wildlife, where *take* is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." At issue was whether modifying a habitat (i.e., in this case sheep browsing on *mamane* trees) may result in "harm" to a species thereby meeting the definition of "taking."

In 1979, a Federal court rendered an opinion in support of the plaintiff. Since studies showed clearly that the sheep and goats were "destroying or altering" the *palila* habitat, the court ordered DLNR to eradicate them from Mauna Kea and this was nearly achieved by 1981. The ruling did not affect the management of pigs on the mountain.

Following this case, the Service regulations defined "harm" to be "an act which actually kills or injures wildlife." The regulations further explain that "[s]uch act may include significant modifications where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering."

Even though Hawai‘i hunters may associate critical habitat designation with eradicating game animals and loss of prized hunting areas, the eradication of sheep and goats from the *palila*

habitat was based on the Federal *taking* provision of the Act and not on *adverse modification* to the critical habitat. Furthermore, under Federal law, a situation similar to the *palila* habitat would not apply to the habitat for plants since the Federal *taking* provision applies only to listed wildlife and not to plants.

7. PITTMAN-ROBERTSON ACT

Game-management funding is provided as part of the Federal Aid in Wildlife Restoration Act, commonly referred to as the Pittman-Robertson Act. This Act was passed by Congress in 1937 to help restore the nation's wildlife following accumulated damage to forests and grasslands and extensive commercial harvesting of wildlife. Hawai'i's local hunters help fund this program, since revenues for it are derived from an 11 percent Federal excise tax on the price of sporting arms, ammunition, and archery equipment, and a 10 percent tax on handguns. Each state's share of these revenues is determined by a formula that considers the total area of the state and the number of licensed hunters in the state, subject to a minimum level of funding. Each state provides matching funds of at least 25 percent of the program costs from a non-Federal source. Also, each state specifies how the funds are to be spent, while the Service serves as an administrative check to insure that the funds are spent in compliance with the Act.

Because of its small area and population, Hawai'i receives the minimum level of Pittman-Robertson funding. For FY2001, total funding amounted to nearly $1.1 million, of which about $817,000 was Federally funded and about $272,000 was State-funded. The County of Maui received about $170,000 for its game-management program plus another $50,000 for non-game programs.

8. GAME MANAGEMENT CONSULTATION HISTORY

8.a. 1995 Pittman-Robertson Consultation

In March 1995, the Service conducted an internal consultation regarding Pittman-Robertson funding for a series of DLNR projects Statewide. Projects included game bird and game mammal surveys; construction of game mammal and bird water units; mowing and clearing of vegetation from Game Management Areas; and maintenance of existing structures and features. In order to minimize impacts to listed plant species, DLNR proposed to construct exclosure fencing around listed plants; construct new game units in disturbed or previously cleared areas; survey all areas before they were cleared or mowed; and have a knowledgeable person supervise other mowing or maintenance activities to ensure that no inadvertent harm came to listed plants. With these precautions, the Service determined that the proposed projects were not likely to affect the listed species.

8.b. 2001 Pittman-Robertson Consultation

The 2001 Pittman-Robertson Statewide consultation required approximately one man-month of the Service's time, and 60 man-days of the State's time. Based on current salaries and benefit levels, administrative time, and overhead costs, the time spent in consultation cost the Service about $15,600 and the State about $12,000.

During consultation, the Service approved with some modification 65 of 67 game-management projects proposed by DLNR. The Service determined that the two remaining projects could adversely affect listed species. One concerned hunter check stations and game-mammal surveys on Kauaʻi. In this case, the Service requested assurances from DLNR that information collected from check stations and surveys would not be used to maintain or enhance free-ranging game-mammal populations that could adversely affect Federally listed species. For all islands, except Kauaʻi and Lanaʻi, DLNR provided the necessary assurances and the Service concluded that these projects were not likely to adversely affect listed species. For Kauaʻi, DLNR chose to withdraw the project from consideration rather than (1) modify it to avoid adverse impacts to listed species, or (2) pursue a formal consultation.

The second exception concerned a portion of a project that involved leasing 30,000 acres on Lanaʻi for State-managed game hunting, maintenance of hunter check stations, maintenance of game-mammal watering units, and game-mammal population surveys. Because the Service determined that funding the Lanaʻi portion of this project was likely to adversely affect listed species, the Service was unable to approve it as requested. Again, DLNR opted to withdraw the offending Lanaʻi portion of the project rather than (1) modify it to avoid adverse impacts to listed species, or (2) pursue a formal consultation. Modification could have involved expensive fencing to prevent game mammals from migrating into areas that support listed species.

For either or both of the two projects discussed above, DLNR could have pursued formal consultation with the Service with the possibility that they would have received a determination by the Service that the projects were not likely to *jeopardize* the continued existence of listed species and could be funded. But DLNR opted not to do so because: (1) time was too short to assemble needed information and complete the formal consultation; (2) the staff had to make fiscal and budgetary commitments; and (3) the outcome was uncertain.

Instead, DLNR elected to shift funding sources for its wildlife management projects: State monies were used to fund the Kauaʻi and Lanaʻi projects mentioned above, and the remaining Pittman-Robertson funds were used for projects that were originally scheduled to be funded by the State (e.g., game-bird projects).[111] The net effect was no change in the amount of Pittman-Robertson funding provided to DLNR, and modest changes to the wildlife management projects themselves.

On Kauaʻi, DLNR elected to drop a proposed helicopter goat survey project rather than fund it entirely with State monies. The helicopter services would have cost about $4,000. No changes were required for Oʻahu projects.

The more significant changes in Maui and Hawaiʻi Counties involved some new fencing and lids to protect game-bird water stations from being used by game mammals in areas having listed plants. The cost totaled about $110,000 for 29 units on Maui island, 12 units on Molokaʻi and about 70 units on Hawaiʻi island (based on information provided by DLNR, 2002). These projects (1) decreased game-mammal populations in the affected areas or required separate State-funded water stations for game mammals and (2) diverted Pittman-Robertson and State funds from other projects to pay for the additional fencing, lids, and new game-mammal water stations.

[111]DLNR is, however, planning to pursue Pittman-Robertson funding again for the Lanaʻi projects.

Plant critical habitat designations had no role in the above decisions, however, since critical habitat had not yet been designated. The consultation between DLNR and the Service on projects proposed for Pittman-Robertson funding, modifications that were made to projects to avoid adverse impacts, and DLNR's decisions to withdraw the Kaua'i and Lana'i projects and to shift funding sources among projects occurred entirely because of the presence of listed species in affected areas.

9. HUNTING FEES

In February 2002, the Board of Land and Natural Resources increased State hunting fees which are expected to increase revenues to the State by about $200,000 per year. The additional fees will give DLNR additional money and flexibility in funding game-management projects.

APPENDIX VI-B

Resource Management Guidelines

Department of Land and Natural Resources
Division of Forestry & Wildlife

"The basis of the Division of Forestry & Wildlife's (DOFAW's) Resource Management Guidelines is the status of the native vegetation in an area. The character of the vegetation is classified as: 'Most Pristine Native,' 'Native,' 'Considerably Disturbed,' or 'Badly Degraded or Highly Altered.' The vegetation status is then considered in conjunction with public safety, public demand for specific resources, and the effect of the proposed use on the vegetation.

Potential game management strategies have been divided into four categories, called Game Animal Management Classifications. These are:

— Game Production. Game is a primary objective. Areas are managed for public hunting on a sustained-yield basis. Habitat may be manipulated for the purpose of increasing or maintaining the game carrying capacity of the habitat. Hunting seasons and bag limits are set to provide sustained public hunting opportunities and benefits. Some of the Game Management Areas are in this class.

— Mixed Game and Other Uses. Production of game is an objective integrated with other uses such as hiking, production of forest products, and protection of native resources. Game populations are managed to acceptable levels using public hunting. Habitat manipulation for game enhancement may be conducted, but only when it is consistent with other uses. Seasons and bag limits are designed to ensure compatibility with other uses. These areas include portions of forest reserves and some Game Management Areas.

— Game Control. Protection of resources is the primary objective, with emphasis on native plant community and watershed protection. Hunting is used to reduce animal impacts to those resources. Bag limits or seasons are liberal. These areas include watershed areas, portions of forest reserves, Natural Area Reserves, and wilderness preserves.

— Staff Control. Areas designated for animal removal by staff or agency designees because of remoteness, environmental sensitivity, or public safety. Game mammal control is the objective. Control actions can include but are not limited to staff shooting or animal translocation. These areas include portions of forest reserves, Natural Area Reserves, wilderness reserves, and plant and wildlife sanctuaries.

Under DOFAW's Resource Management Guidelines, maintaining game bird populations is considered compatible with other uses in most areas. Game birds are managed for 'Game Production' or 'Mixed Game and Other Uses' in most areas.

Because of potential detrimental effects of game mammals on native ecosystems, management strategy for game mammals is more complex. Areas managed for game mammal production; i.e., 'Game Production,' are located primarily in areas classified as 'Badly Degraded or Highly Altered.' These areas have a preponderance of weedy species, contain very few native plants, and are managed to produce game animals for recreational hunting. Under this management approach, known individuals or populations of listed plants are fenced or otherwise protected from feral ungulates. Areas classified as 'Predominantly Native' and 'Considerably Disturbed' are managed as 'Mixed Game and Other Uses' for game mammals and have seasons and bag limits designed to ensure compatibility with other uses, including native ecosystem protection. Areas classified as 'Most Pristine Native' are managed for 'Game Control or Staff Control' and have the most liberal hunting seasons to minimize the pressure of feral animals on native ecosystems."

Hawai'i Department of Land and Natural Resources
Undated

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Government

- County of Maui, Planning Department
- County of Maui, Department of Finance, Real Property Tax Division
- County of Maui, Board of Water Supply
- Hawai'i Army National Guard
- Hawai'i Department of Agriculture
- Hawai'i Department of Hawaiian Home Lands
- Hawai'i Department of Land and Natural Resources
- Hawai'i Office of Environmental Quality Control
- Kaho'olawe Island Reserve Commission
- U.S. Department of Agriculture, Natural Resources Conservation Service
- U.S. Department of the Navy
- U.S. Fish and Wildlife Service, Pacific Islands Field Office
- U.S. Department of Interior, National Park Service, Haleakala National Park
- University of Hawai'i, Institute for Astronomy

Private

— Alexander & Baldwin, Inc.
— Amfac
— Campbell Estate
— C. Brewer
— Decision Analysts, Hawai‘i, Inc. (DAHI)
— Haleakala Ranch
— Hana Ranch
— Hawaii Cattlemen’s Council
— Industrial Economics, Inc.
— Kaupo Ranch
— Maui Electric Company, Inc.
— Maui Land and Pineapple (Maui Pineapple Ltd.)
— Nobriga’s Ranch
— Ulupalakua Ranch

Non-profit

— East Maui Watershed Partnership
— Hawai‘i Television Broadcasters Association
— Earthjustice Legal Defense Fund
— Hawai‘i Agriculture Research Center
— The Trust for Public Land
— West Maui Mountains Watershed Partnership